ELECTRICAL REVIEW

FRIDAY
1 SEPTEMBER 1961

WEEKLY
PRICE 1s 6d

Extra C2

RECEIVED
29 SEP 1961

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 BLOOMSBURY STREET, LONDON, W.C.1

The "EXEL" Range of Switchgear

Complies with B.S. 2510: 1954

Modern buildings demand switchgear of sound technical performance and compliance with the latest relevant British Standards, and that is in harmony with the most modern surroundings. The 'Exel' range of switchgear will meet all these requirements.

Fabricated cases are of heavy gauge sheet steel with hinged covers, rust-proofed and finished grey stove enamel. Chrome plated front operating switch handles.

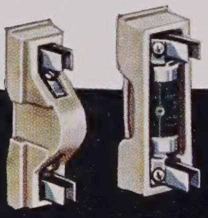
Removable endplates are provided at top and bottom of case with semi-pierced knockouts which, on removal, provide clearance holes for conduit.

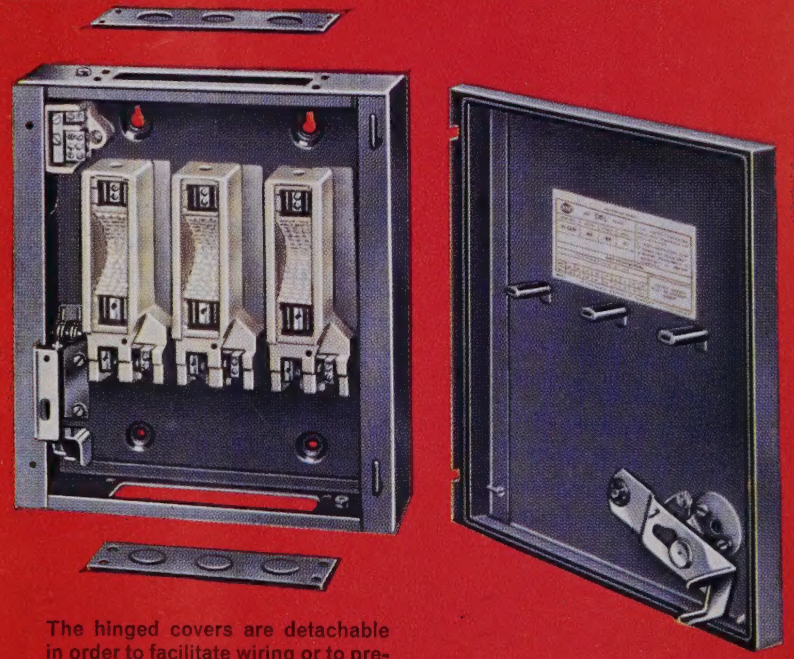
RATINGS: 15-30-60-100 AMPS

500 VOLTS A.C. or D.C.

Fuses are of the new 'Kantark-Exel' pattern which will accept semi-enclosed rewirable or H.R.C. Fuses.

Semi-enclosed rewirable (damper type) patterns comply with B.S. 3036: 1958.





The hinged covers are detachable in order to facilitate wiring or to preserve finish.

Gaskets are fitted to all covers, rendering the switchgear enclosures dust and weather proof.

H.R.C. cartridge patterns, which are interchangeable with the semi-enclosed rewirable patterns, comply with B.S.88. 1952.

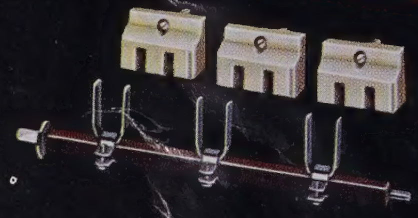
M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links to B.S.88.1952, Appendix 'J' Dimensions, Form A-Offset Tags.

All live metal is adequately shielded to avoid accidental contact when cover is open. The porcelain shields also serve as efficient arc barriers.

Wiring space is generous. A detachable switchbar facilitates wiring.

All units are arranged for internal fixing. Keyhole slots are provided at top. There are no external lugs.

The 'Exel' range ensures compliance with the most strict interpretation of I.E.E. Regulations (13th Edition), and with the requirements of The Electricity (Factories Act) Special Regulations.



MEM

THE GREATEST SAFEGUARD AN INSTALLATION CAN HAVE

Write for catalogue No. 450 R

MIDLAND ELECTRIC MANUFACTURING CO. LTD., REDDINGS LANE, TYSELEY, BIRMINGHAM, 11

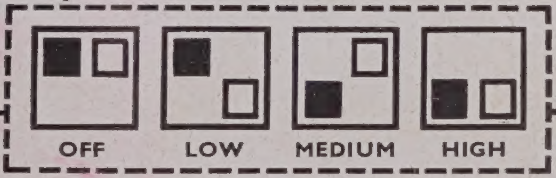
BACKGROUND HEATING ON A BUDGET BASIS

Heatrae Sleekline

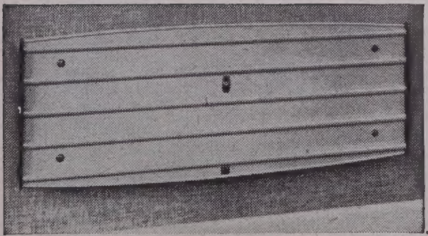
FLOOR MODELS
4 ft, 3 ft and 2 ft

DECENTRALISED ELECTRIC HEATING UNITS

with Personal Heat Control



Here is the central heating system that can be installed in any home, new or old, with little or no installation costs—and it's a system that can be added to from time to time as required. What is more it can be removed from home to home.



WALL MOUNTING UNITS

4 ft, 3 ft and 2 ft

The simple fixing of wall mounted units enables them to be removed in a few seconds when re-decorating or spring cleaning. They can be installed with room-thermostat control.

LOADINGS

4 ft. . . .	800 watts
3 ft. . . .	600 watts
2 ft. . . .	400 watts

Write for Leaflet No. 103

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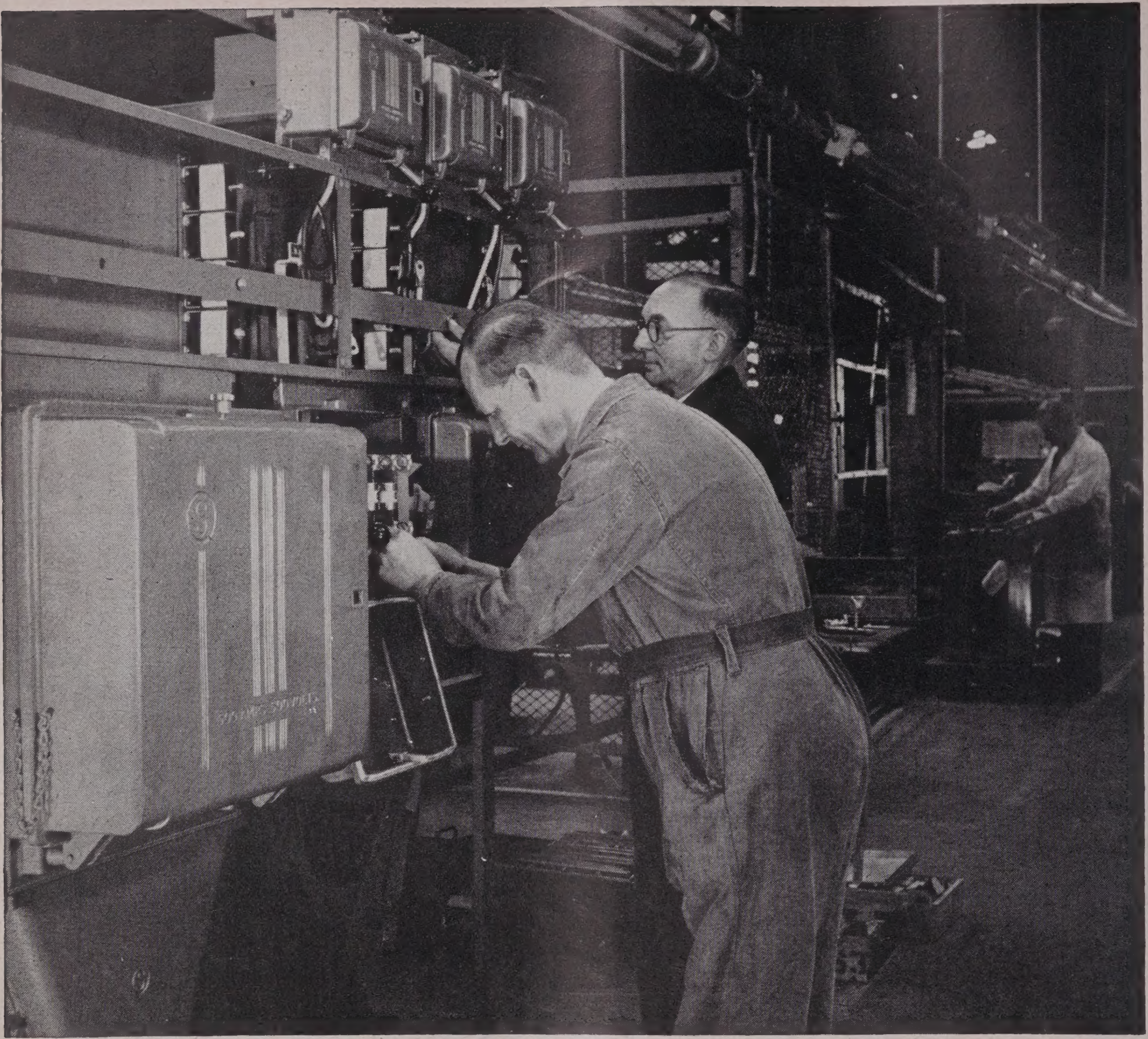

Whichever way you look at it

Whichever way you look at it, SANDACLAD Switchgear is 'just the job'. Perfect as can be in conception, design and manufacture it bears the unmistakable stamp of quality. From our point of view, SANDACLAD Switchgear—indeed, every Sanders product—embodies the best of modern techniques both in design and fabrication. For the electrician SANDACLAD Switchgear offers the simplicity of speedy, easy wiring and the elimination of time-wasting frustrating re-adjustments. And the user can have complete confidence in the capability of SANDACLAD Switchgear to perform its allotted task and to carry its designated loading. Dependable, reliable and as pleasing in appearance as such equipment can be, SANDACLAD Switchgear provides safe, immediate and lasting control of electrical power.

SANDACLAD SWITCHGEAR IS RIGHT IN EVERY ASPECT

SANDERS

WILLIAM SANDERS & CO. (WEDNESBURY) LTD. · FALCON ELECTRICAL WORKS · WEDNESBURY · STAFFS

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NO MORE TROLLEY-WIRE ACCIDENTS WHEN
YOU INSTALL FULLER ELECTRIC POWER TRACK

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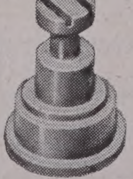
Fuller Electric Power Track eliminates the dangers continually threatened by bare trolley wires. More and more factories are being equipped with this simple protected system that ensures safe working conditions. Power Track is guaranteed to give 100 per cent protection when tested with the standard Test Finger to BSS 3042/1958. Unlimited lengths of track, in straight or curved sections, can be erected for operation on all types of supply up to *200 amps per conductor*. Isn't it time that *your* factory was protected by a Fuller Electric Power Track?

The long and the short of it.

Sometimes tall, sometimes small, always accurate and delivered with speed, Delanco components produced in a very wide range of materials, and worked out of sheet, rod or tube have many advantages. Our capstan and automatic lathes produce insulation bushes, oil plungers, bolts, post insulators, taper pins, shear pins, prototypes for mouldings, etc, quickly and economically.

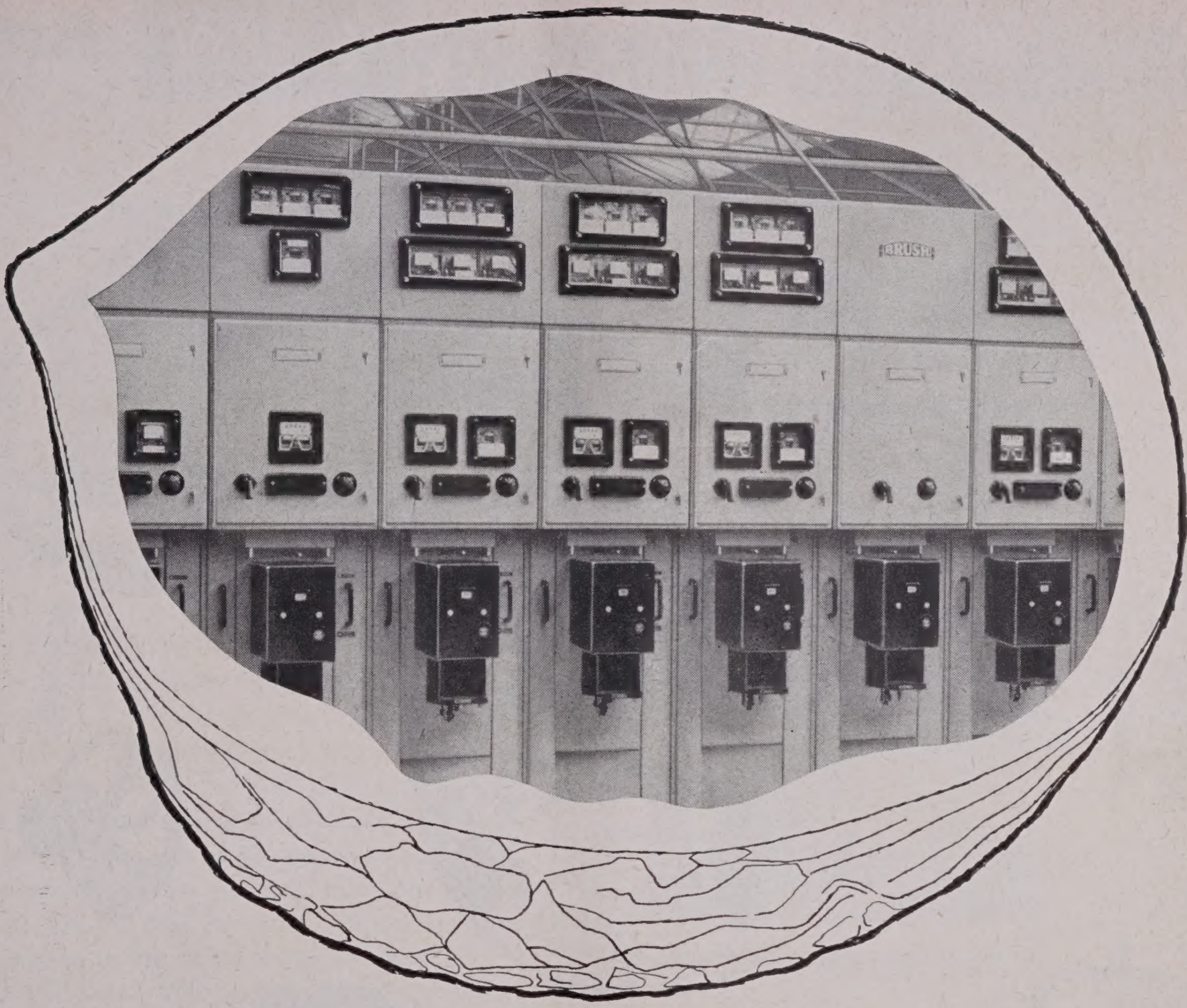


Dependable

Delanco

for Electrical Insulation

Anglo-American Vulcanized Fibre Co. Ltd.,
Cayton Works, Bath Street, London, E.C.1.
CLE. 8484. Grams: Prompserv, Cent, London.
Delanco Works, Leonard Street, London, E.C.2.



HOW COMPACT CAN YOU GET ?

Switchboards with piecemeal extensions are a thing of the past. This Metalclad Switchgear by Brush not only presents a uniform appearance — it saves space too. Standardised additions can be easily installed — every one as neat as the first.

Brush Switchgear offers: *Versatility. Compactness at high MVA Ratings. Easily accomplished uprating to higher MVA levels.*

Brush Metalclad Switchgear for Supply Industry and General Industry.

3.3. kV 75 MVA 150 MVA · **6.6. kV** 150 MVA 250 MVA 350 MVA
11. kV 150 MVA 250 MVA 350 MVA 500 MVA

For all the above ratings the Brush range can be supplied in 400, 800 and 1,200 ampere units in 2′ panel widths and 1,600 ampere units in 2′ 6″ panel widths. Can be supplied with air-insulated or compound-filled bus bar chambers for single or double bus bar arrangements. All ratings certified by the Association of Short Circuit Testing Authorities to BS 116/1952 and relevant ASTA rules.

BRUSH

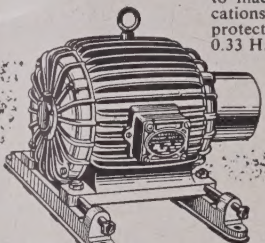
BRUSH ELECTRICAL ENGINEERING CO. LTD · LOUGHBOROUGH · ENGLAND

A member of the Hawker Siddeley Group.

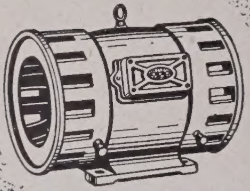
Concerned with revolutions?

. . . so are we. Since 1910 we have been steadily gathering the experience which gives each of our motors the ability to withstand arduous service conditions. Our range is extensive, covering fractional to heavy duty A.C. motors, "standards" or "specials".

Totally enclosed fanless motor of robust construction ideally suited to machine tool applications. No larger than protected types. Range 0.33 H.P. to 10 H.P.

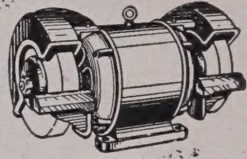


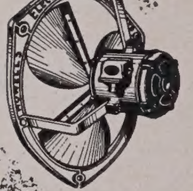
Totally enclosed syren. Weatherproof and requiring little or no maintenance.



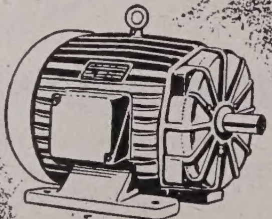
Vertical Skirt Mounting Slip Ring or Repulsion Induction Motor available also in other Types, or with Flanged End plate, with or without feet and cowl for horizontal or vertical applications.

Totally enclosed motorised grinder with large diameter shaft of high quality steel, for bench or pedestal.

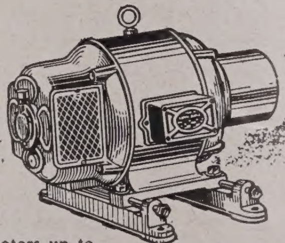




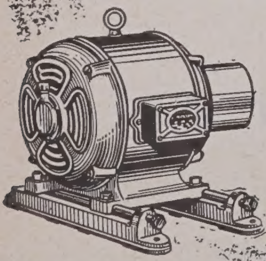
Totally enclosed ventilating fan having mild steel blades rivetted to centre boss; ring of fine grade cast iron, available 9"—48".



Fan cooled totally enclosed motor to British Standard Dimensions having low temperature rise and high torque characteristics.



Slip ring motors up to 45 H.P. and repulsion induction up to 10 H.P.



Protected type high torque motor with lift or crane rating, flange or skirt ring mounting from ¼ H.P.—55 H.P.

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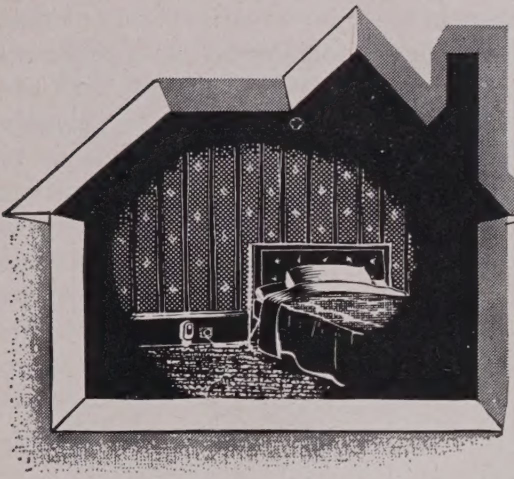
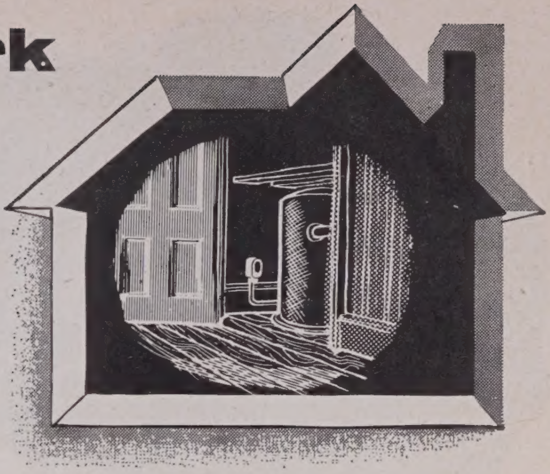
VALE PLACE WORKS, HANLEY, STOKE-ON-TRENT, ENGLAND

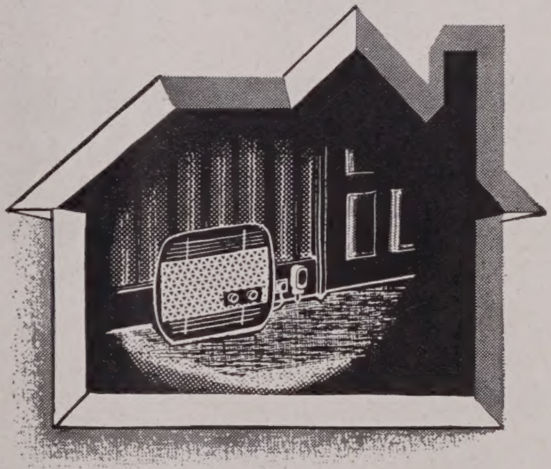
Branches at: LONDON . MANCHESTER . BRISTOL . BIRMINGHAM . GLASGOW . LEEDS

PLEASE QUOTE P. 103A 107

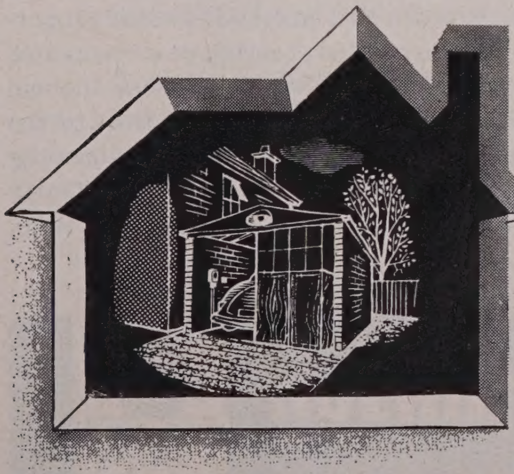
Put VENNER to work about the house



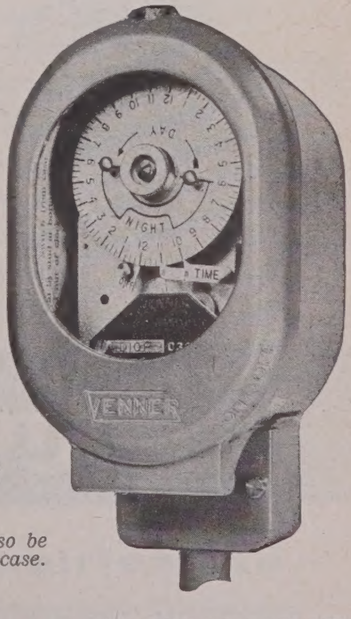




The average home today relies more and more on electrical equipment which can prove expensive if it is not properly controlled . . . immersion and under floor heating, for example. The Time Switch type MD1QP illustrated can switch an immersion heater off at night as well as on again in the morning while the family are still sleeping, saving power overnight but still providing hot water when it is needed. It can also control an electric blanket, porch or drive lighting, or a wireless set used as an early morning alarm.



Once set, the Time Switch needs no attention. The clock is electrically actuated; an external switch allows the appliance which it controls to be turned off when it is not needed. There are many variations of the Venner Time Switch, all described in our No. 1 series of leaflets, free on request.



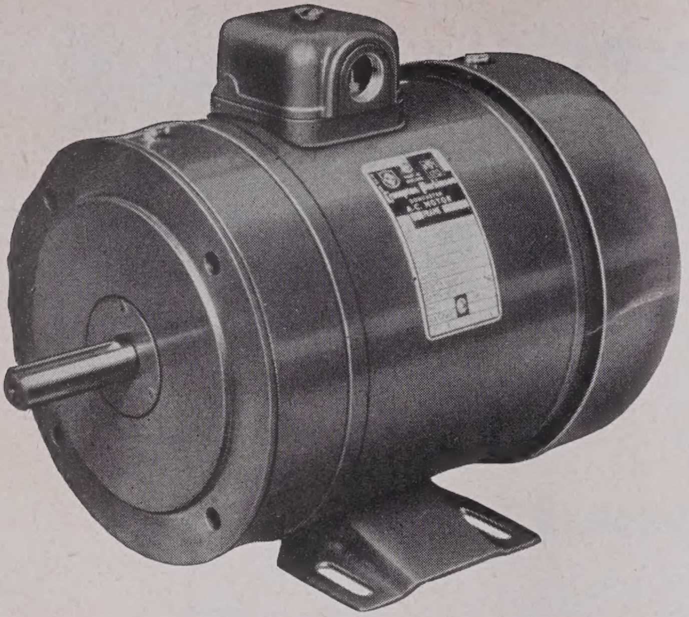
A cable cover is available for conduit wiring. Rating 20 amps. 200/250v. A.C.

The Time Switch can also be supplied in an all-plastic case.

You are invited to visit our
STAND No. 1
A.P.L.E. EXHIBITION, SCARBOROUGH
OCTOBER 3-6

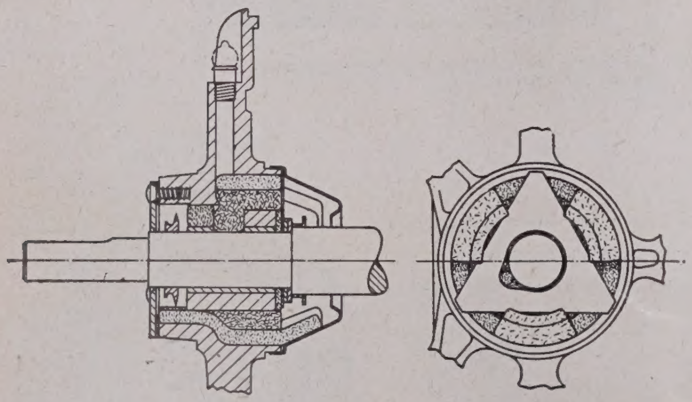
Venner Limited, Kingston By-Pass,
New Malden, Surrey.
Telephone: MALden 2442

VENNER Time Switches



Most industrial motors today have ball or roller bearings; they were, in fact, standardised on C.P. motors at a time when most other manufacturers still fitted sleeve bearings. We fitted them because we realised early on that they can survive long periods without maintenance. But, on the other hand, they are noisier than good sleeve bearings properly lubricated and, in many of the places in which our F.H.P. motors are used, silence is important. What was wanted, then, was a sleeve bearing that would work with as little maintenance as a ball race. We developed the original Marathon sleeve bearing, which was quite outstanding in this respect, many years ago, and our Marathon Mark III is the result of even further improvements to that design.

This thing called know-how



This bearing is an excellent example of that part of engineering design that stems from experience rather than theory and is covered by the possibly ugly but certainly indispensable term—know-how. The oil cavity is large and filled with highly absorbent felt which, acting as a wick, circulates the oil continuously, and which also acts as an oil filter. The thrust is taken on a bakelised washer supported by a steel washer, bearing on a triangular plate of spring steel which cushions the end thrust. The thrust faces are lubricated by the felt projecting through a D-shaped opening in this plate. These bearings run silently without attention for a year or more at a time.

Crompton Parkinson
LIMITED

ELECTRICAL EQUIPMENT

Makers of Electric Motors of all kinds, A.C. and D.C. Generators, B.E.T. Transformers, Switchgear, Cables, Instruments, Lamps, Lighting Equipment, Batteries, Stud Welding Equipment, Traction Equipment, Ceiling Fans.

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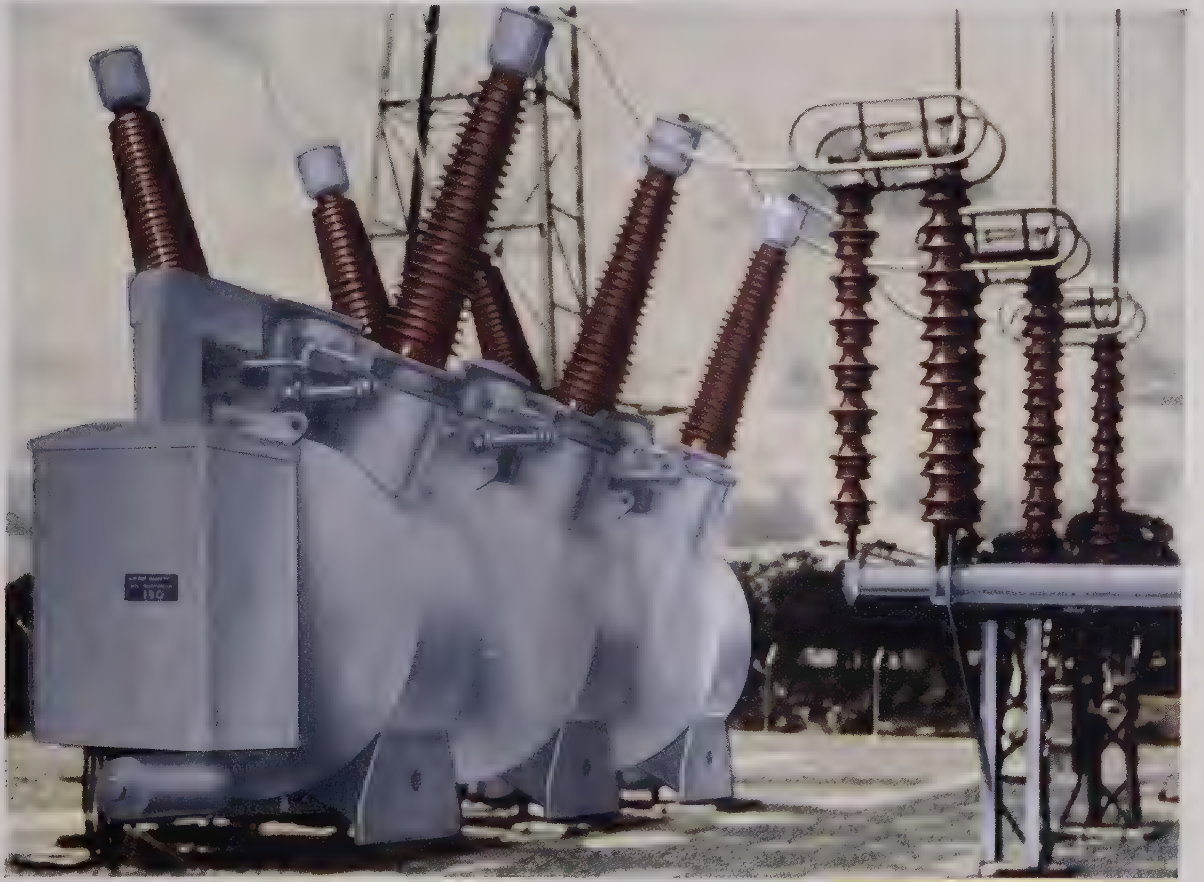
F613

AEI Switchgear at KARIBA



Type JW421, 330-kV, 7,500 MVA Oil Circuit Breaker at KITWE Substation, Kariba Hydro-electric Scheme. Consulting Engineers:- Messrs. Merz & McLellan.

A notable contribution to the great Kariba Project is seen in the Switchgear supplied by AEI—one of the largest export orders to be received by a British manufacturer, including twenty-five 330-kV Oil Circuit Breakers and more than one hundred 330-kV Isolators—installed at seven substations in Northern and Southern Rhodesia.

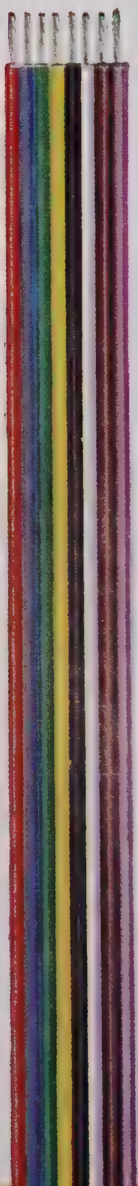
AEI are well qualified to deal with the many problems which arise in connection with major schemes everywhere.

Reduction in the Site Area of the 330-kV Substation at Kariba was an important consideration and this was achieved with the Station layout incorporating AEI Lenticular Tank Oil Circuit Breakers and Vertical Lift Pattern Isolators.

For further information, write to your local AEI Office or direct to AEI Switchgear Division,
Willesden Works, Neasden Lane, London N.W.10.

AEI Associated Electrical Industries Ltd.
Switchgear Division
TRAFFORD PARK, MANCHESTER · HIGHER OPENSHAW, MANCHESTER · WILLESDEN LONDON
F/A 108

RIBBON CABLES



IF YOU are looking for cables

Designed to operate in limited space

In vivid colours to assist identification of cores

Compact and neat RIST'S RIBBON CABLES are the answer

You can rely on RIST'S

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Sole London Distributors for Housewiring Cables and Flexibles:
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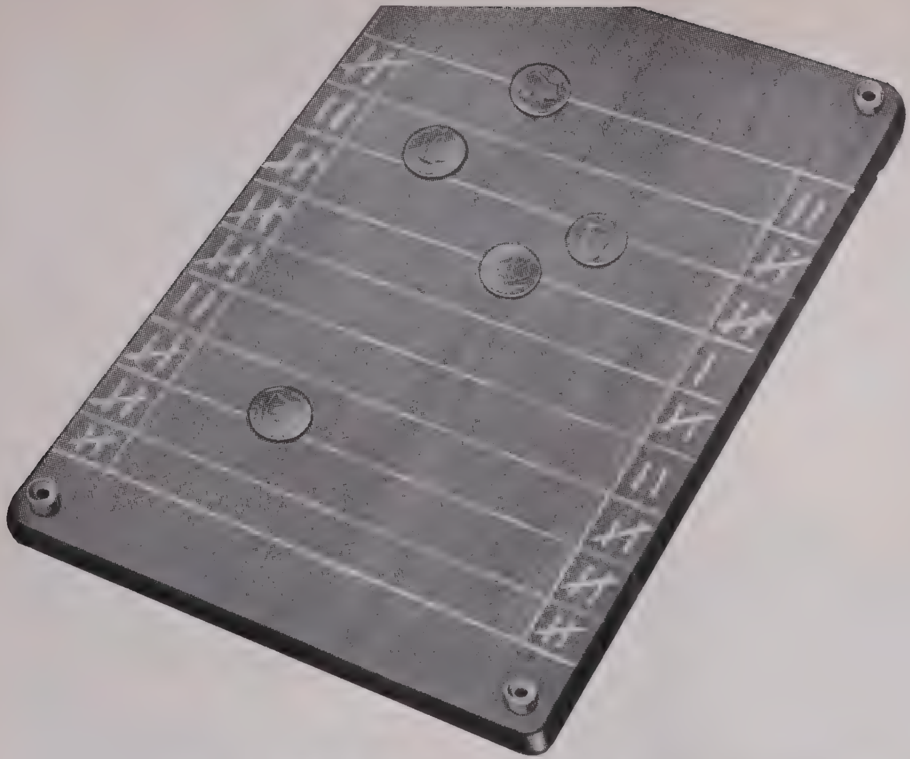

Wootton meter boards win every time!

Obviously, when they're Wootton-made, and Wootton-tested. Made from the best plywood Wootton could lay hands on. Tested for reliability . . . toughness . . . durability. Wootton meter boards stand up to anything. No contraction or expansion warping with Wootton! Oh, and there's more to Wootton than just meter boards. They make wood blocks too, and instrument cases, and they're brilliant at sunk switch boxes.

WOOTTON-the meter board people

WOOTTON & CO. LTD
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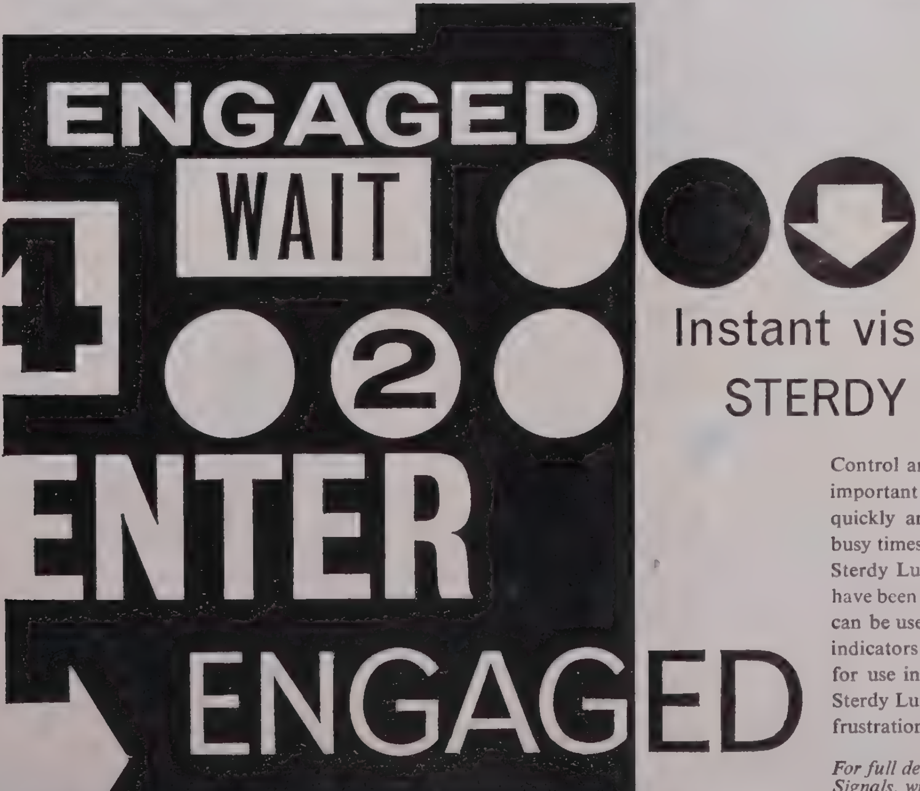

Instant visual contact
STERDY luminous signals

Control and communications are playing an increasingly important part in business life, the ability to contact staff quickly and unobtrusively is a golden virtue in these busy times.

Sterdy Luminous Signals in a variety of different forms have been developed to oil the wheels of commerce. They can be used for staff location, as Engaged—Enter—Wait indicators on executive's doors and as lift signals. Ideal for use in Hospitals, Factories and Offices of all sizes, Sterdy Luminous Signals can banish business worries and frustrations—by improved visual communications.

For full details of Sterdy Luminous Signals, write to:

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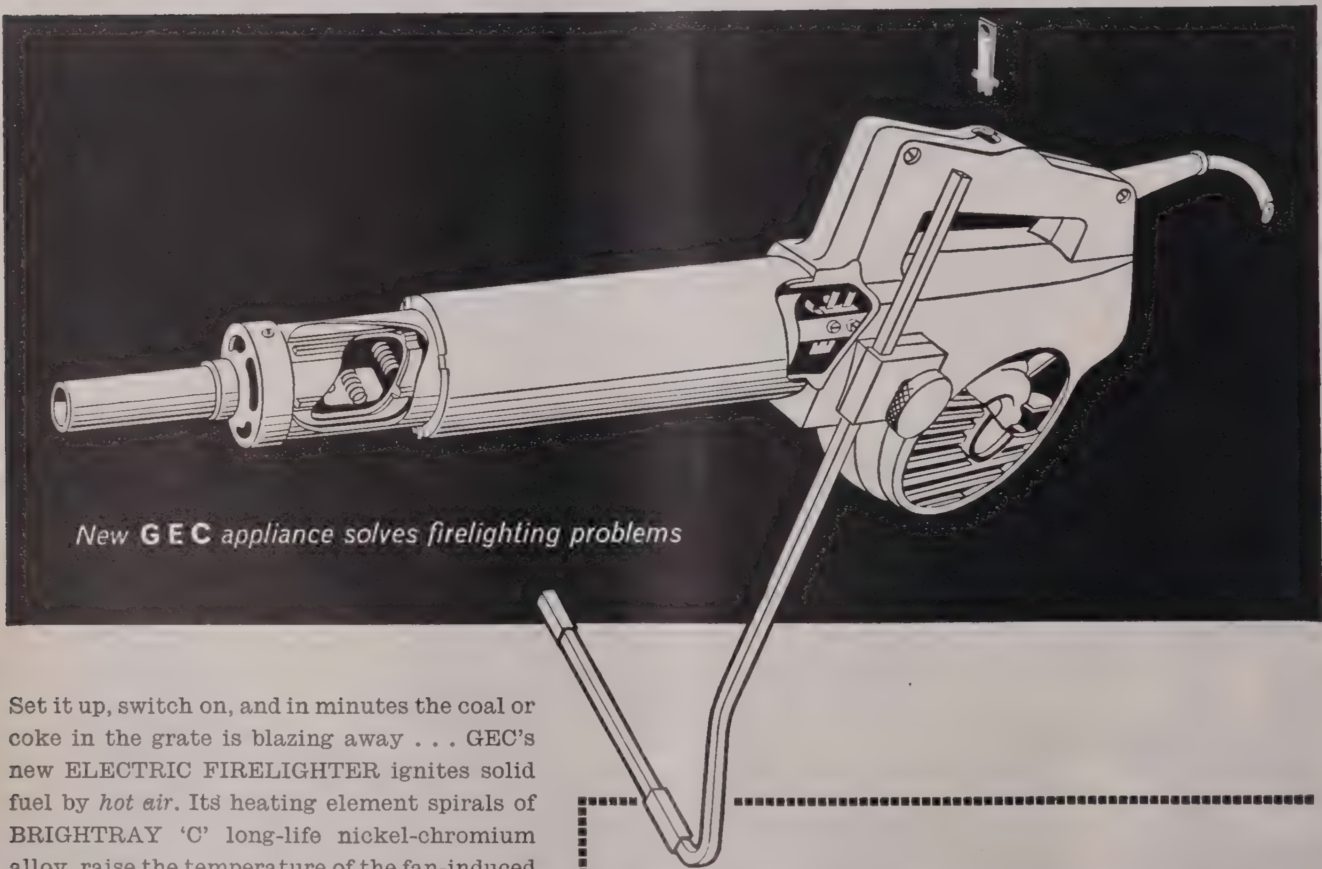
PIONEERS IN SPECIALISED COMMUNICATIONS
Queen's House, 180-182, Tottenham Court Road, London, W.1
Telephone: MUSeum 4414, 4415 and 6388

EST. 1920 STERDY TRADE MARK

AP 93

FIRELIGHTING IS FASTER WITH HEATING ELEMENT SPIRALS OF

Brightray*C ALLOY


New GEC appliance solves firelighting problems

Set it up, switch on, and in minutes the coal or coke in the grate is blazing away . . . GEC's new ELECTRIC FIRELIGHTER ignites solid fuel by *hot air*. Its heating element spirals of BRIGHTRAY 'C' long-life nickel-chromium alloy, raise the temperature of the fan-induced air to the point at which domestic solid fuels rapidly ignite. The 1800-watt BRIGHTRAY 'C' element can be switched off leaving the air jet to fan the flames. Running costs are low, fire-lighting easier, *and faster*.

Designers are invited to send for our publication giving useful data on the BRIGHTRAY Series of Electrical Resistance Materials.

*TRADE MARK

To Henry Wiggin & Co Ltd, Wiggin Street, Birmingham 16.

Please send me a free copy of your publication
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COMPANY AND ADDRESS ____________________

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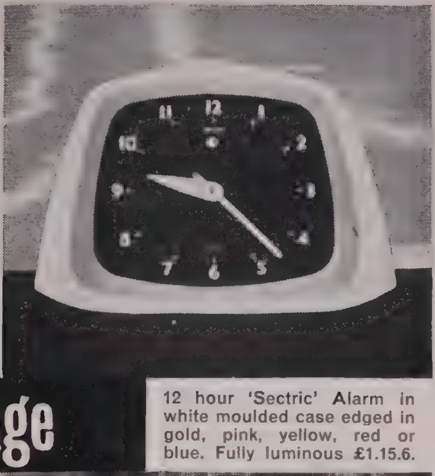
To send your 'Sectric' sales soaring



Page

12 hour 'Sectric' Alarm in white moulded case edged in gold, pink, yellow, red or blue. Fully luminous £1.15.6.

Pageboy

12 hour 'Sectric' Alarm. In black, blue or mushroom. Spot luminous £2.0.0.

Autorise Alarmalite

24 hour fully automatic Sectric alarm complete with bedside lamp and lavender shade. Luminous £4.16.6.

These up-to-the-minute 'Sectric' Alarms are already popular favourites. Right in line with contemporary taste. Stylish and beautifully designed, with colours to blend with modern decorative schemes. Prices popular too. Plus 'Sectric' accuracy, 'Sectric' dependability, and no winding or regulating. Fully guaranteed of course. To display them is to sell them. Order your supplies now.

SMITHS 'SECTRIC' ALARMS

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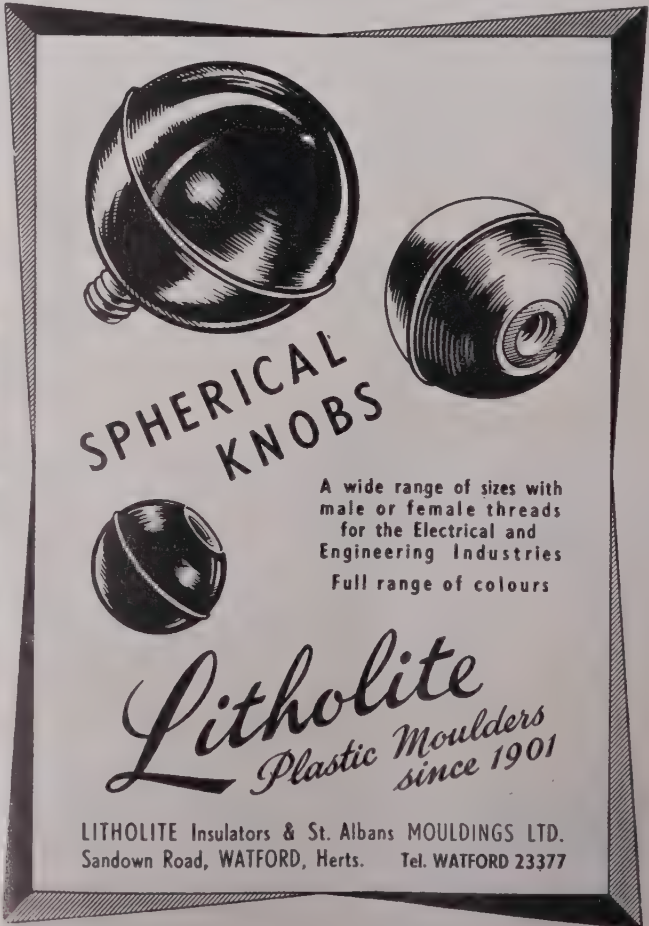
don't miss the important news which appears on Page 49



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AMAZING WHAT RAWLPLUG FIXING DEVICES CAN DO!

Light job or heavy, solid material or cavity, Rawlplug Fixing Devices make every screw or bolt fixing easy and straightforward—even the 'impossible' ones! Just look at these examples.

BOLT FIXING . . .

Here's strength again! In Hong Kong, normal tackle failed to lift 5-ton boulders from a 20 ft. deep pit. Solved by drilling to take a 'K' size Rawlbolt with 1″ diameter eyebolt. Nothing approaches Rawlbolts for strength, ease and speed—no cold chiselling, no grouting in, no waiting for cement to harden.

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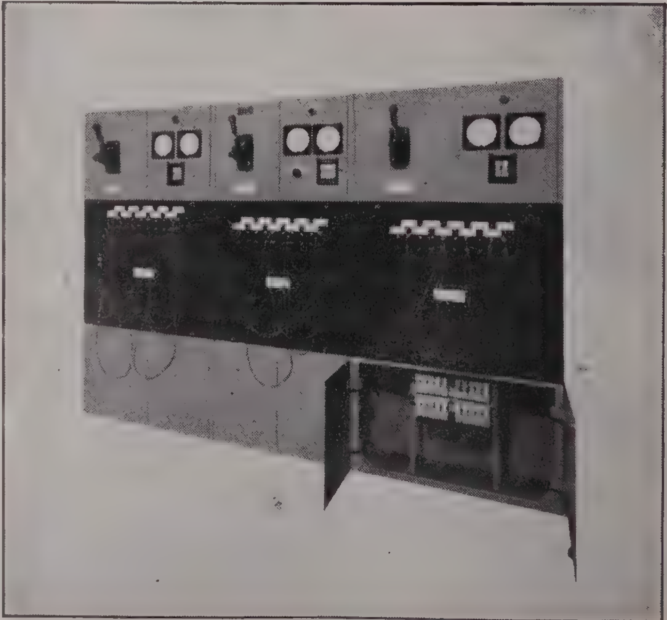

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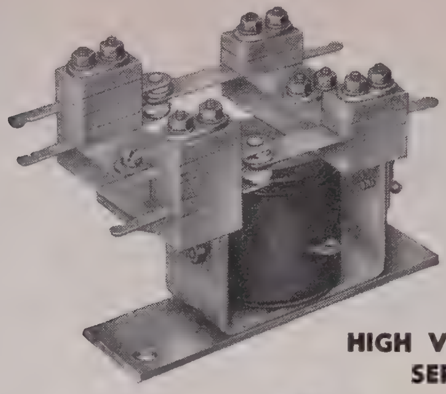

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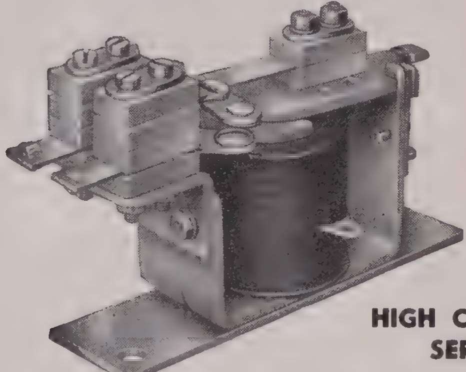

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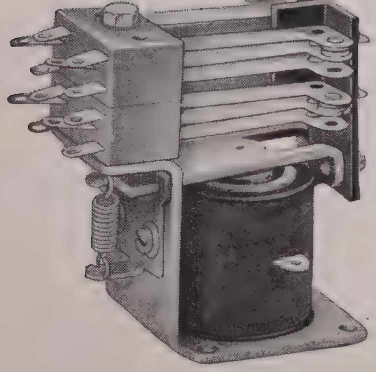

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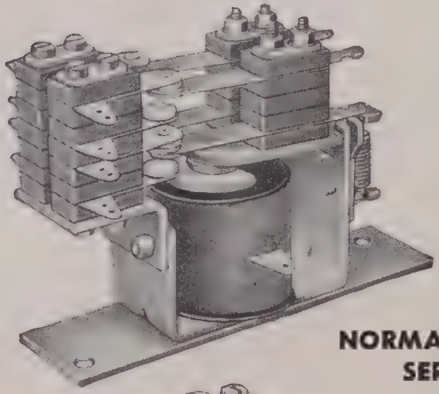

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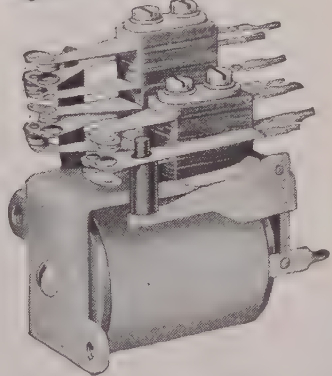

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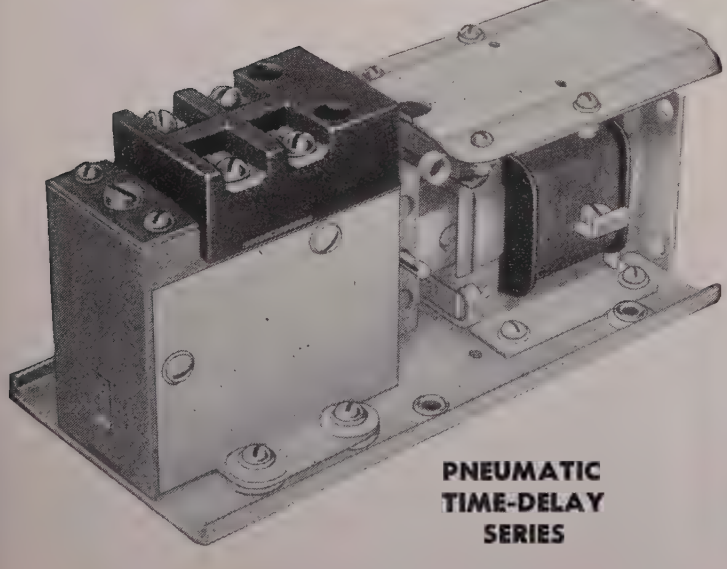

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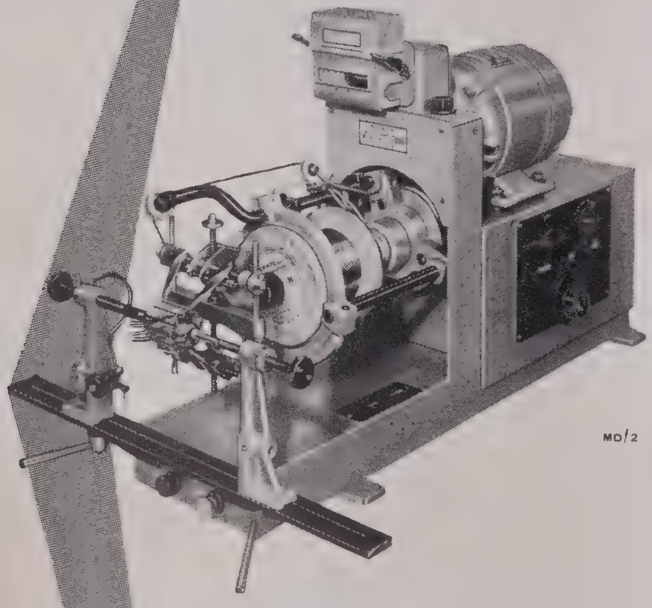

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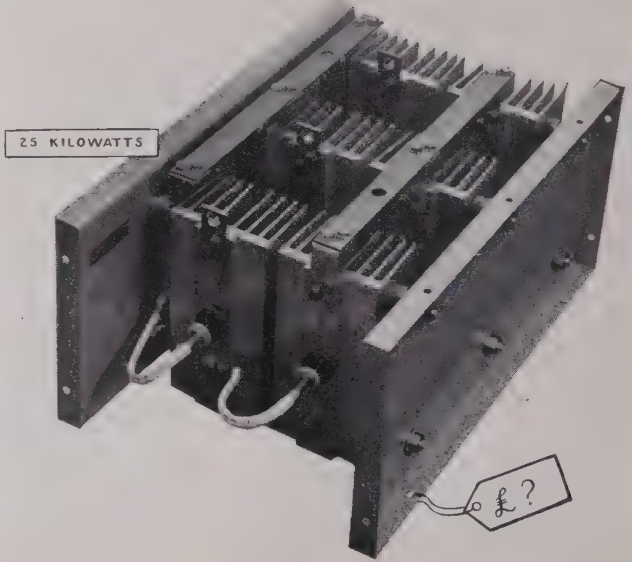

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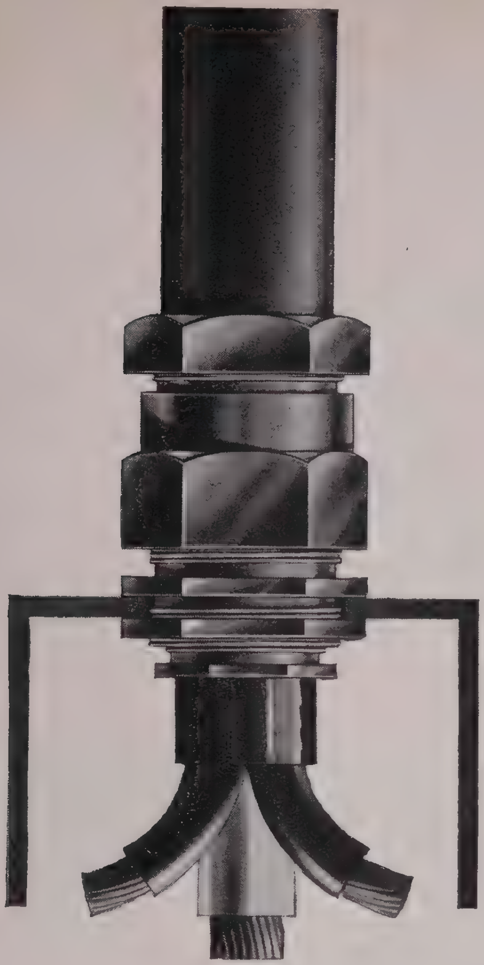

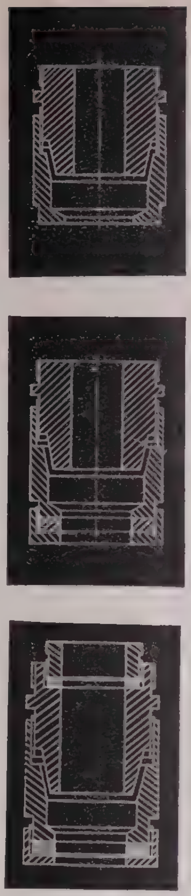

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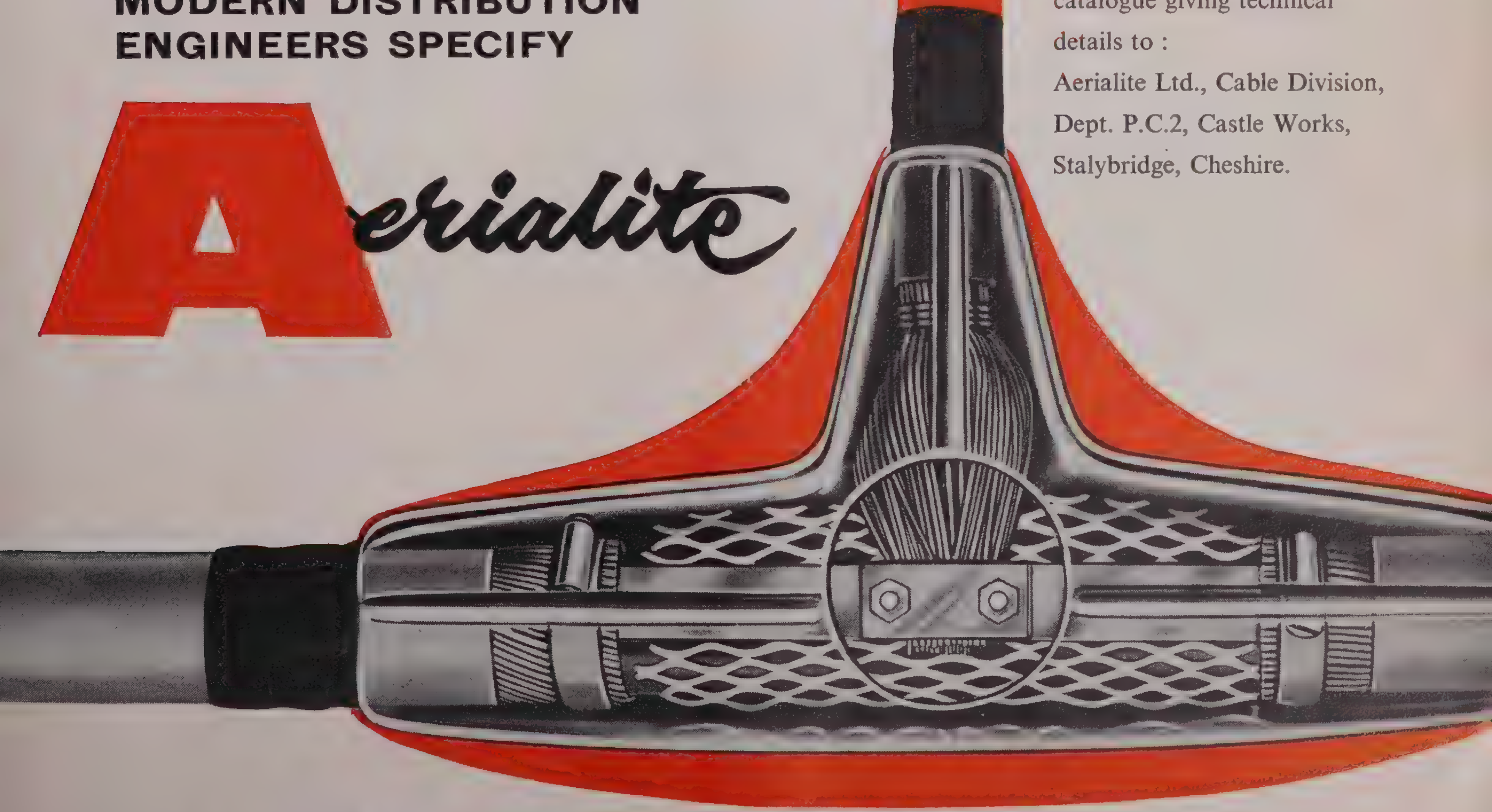

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Simplex Star switchfuses 15, 30, 60 amp. 500 volt.
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Distribution fuseboards 15, 30, 60 amp. 500 volt.

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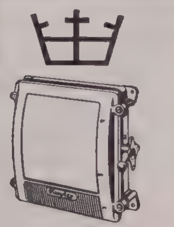
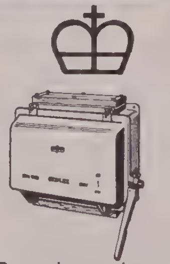


Complementary Simplex Regent range. Robust, stylish switches, switchfuses, changeover switches 15, 30, 60, 100 amp. 500/600 volt. Busbar chambers 350, 550, 800 amp. 600 volt. Distribution fuseboards 15, 30, 60 amp. 500 volt.



Complementary Simplex Monarch range. Heavy duty fuse switches. Suitable for all lighting, heating and power loads without de-rating. 150, 300 amp. 500 volt.

S.4.

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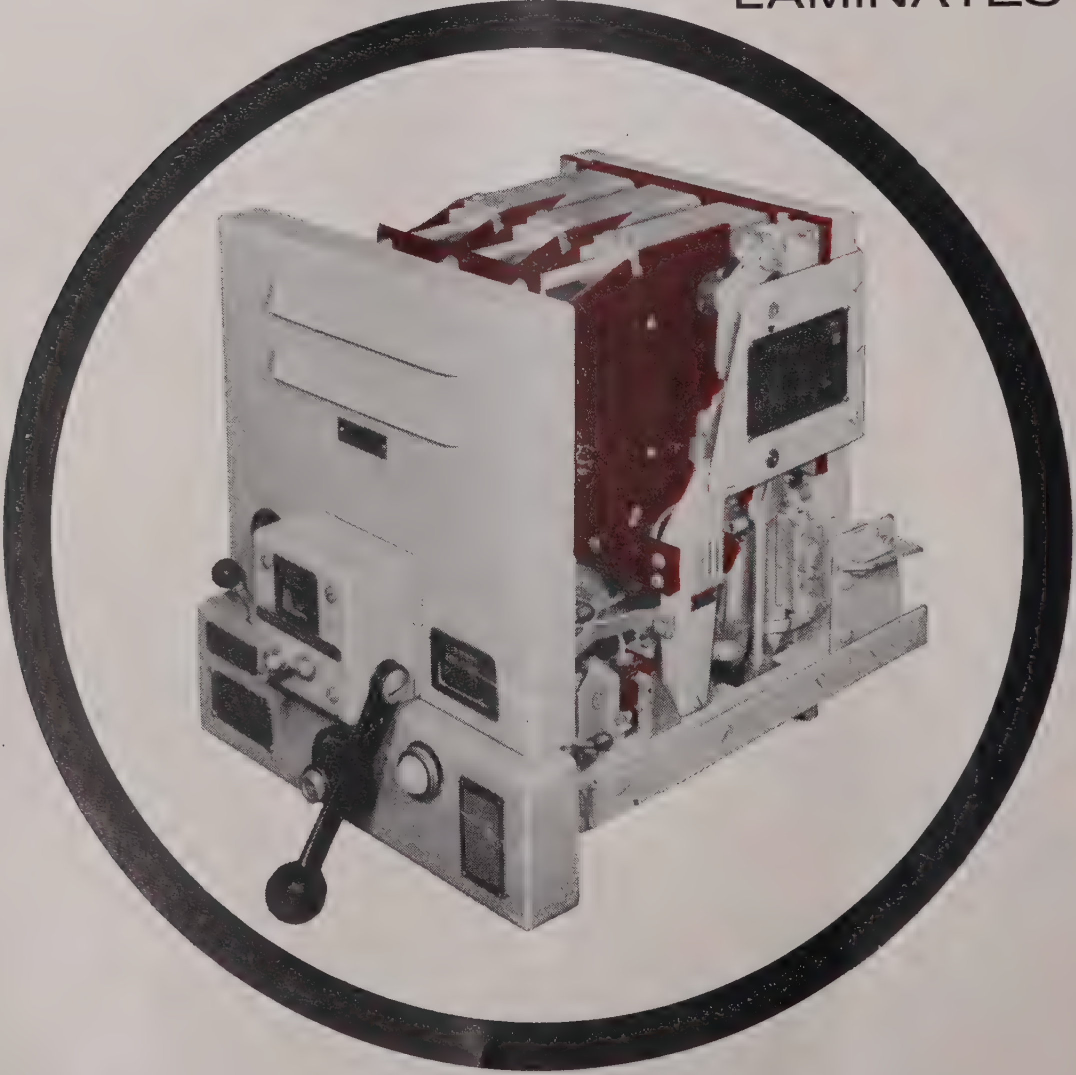

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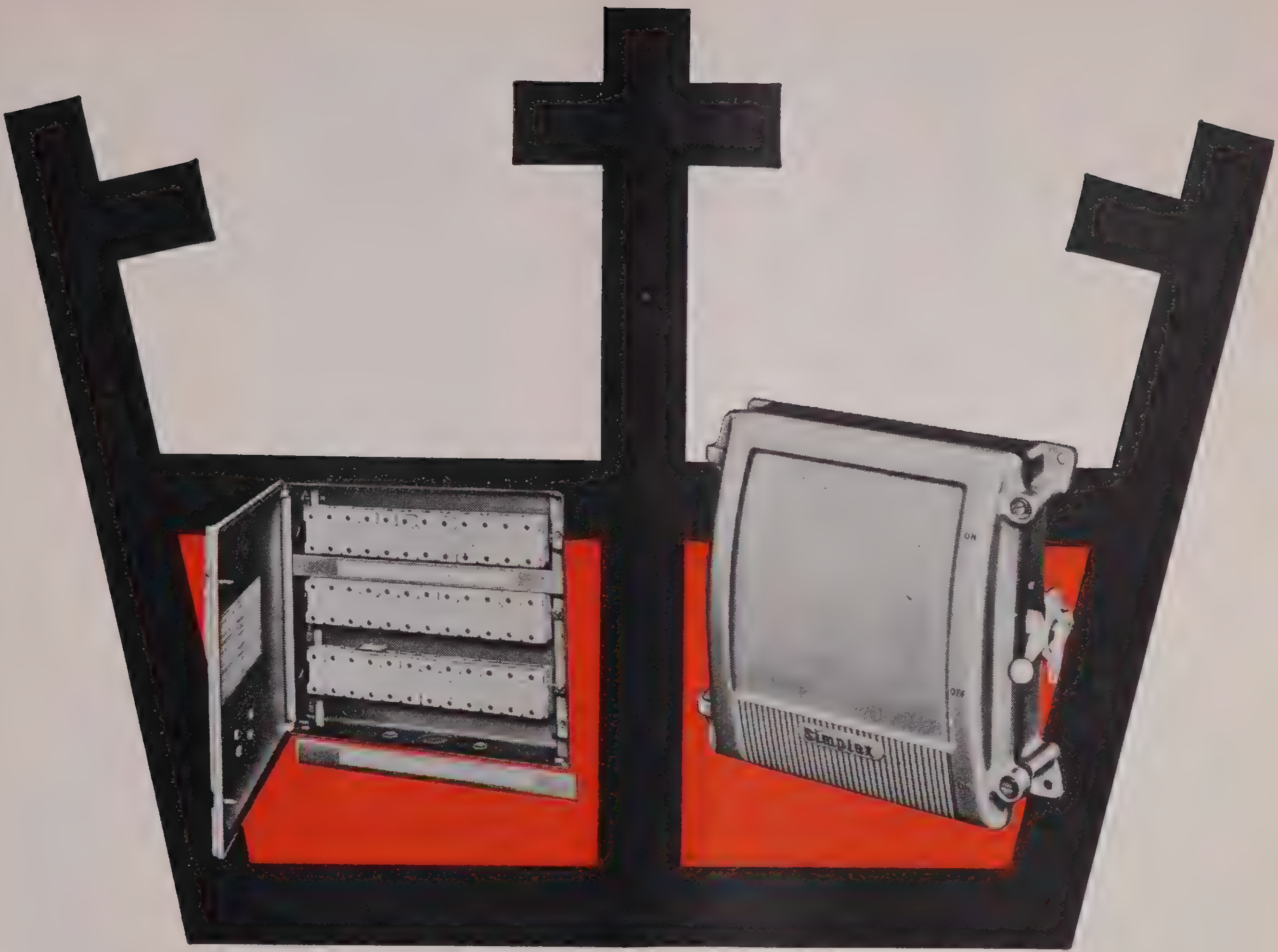

SIMPLEX REGENT SWITCHGEAR PART OF THE COMPREHENSIVE MEDIUM VOLTAGE SIMPLEX RANGE OF SWITCHGEAR

The sturdy, stylish Regent range of switches, switchfuses, and changeover switches are conventionally constructed to meet a very wide range of requirements. The casings are weatherproof and dust protected as defined in BS 861 and 2510. All units are HRC or rewireable — fuses completely interchangeable.
Sealing chambers and glands for Regent switchfuses are made for any type and size of normally used cable, either straight or reverse entry without drilling. The entire Simplex Regent range is suitable for lighting, heating and power loads without de-rating.
Switches, switchfuses, changeover switches 15, 30, 60 and 100 amp. 500 volt.
Busbar chambers 350, 550, 800 amp. 600 volt.
Distribution fuseboards 15, 30 amp. 500 volt.

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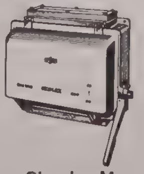
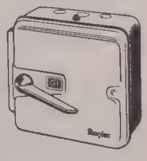


Complementary Simplex Monarch range. Heavy duty fuse switches, suitable for all lighting, heating and power loads without de-rating. 150, 300 amp. 500 volt.



Complementary Simplex Star range. Economically priced, front operated switchfuses in 15, 30, 60 amp. 500 volt. Busbar chambers 200, 400, 600 and 800 amp. 600 volt. Distribution fuseboards 15, 30, 60 amp. 500 volt.

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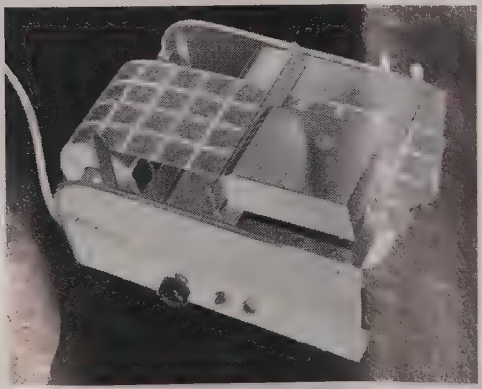

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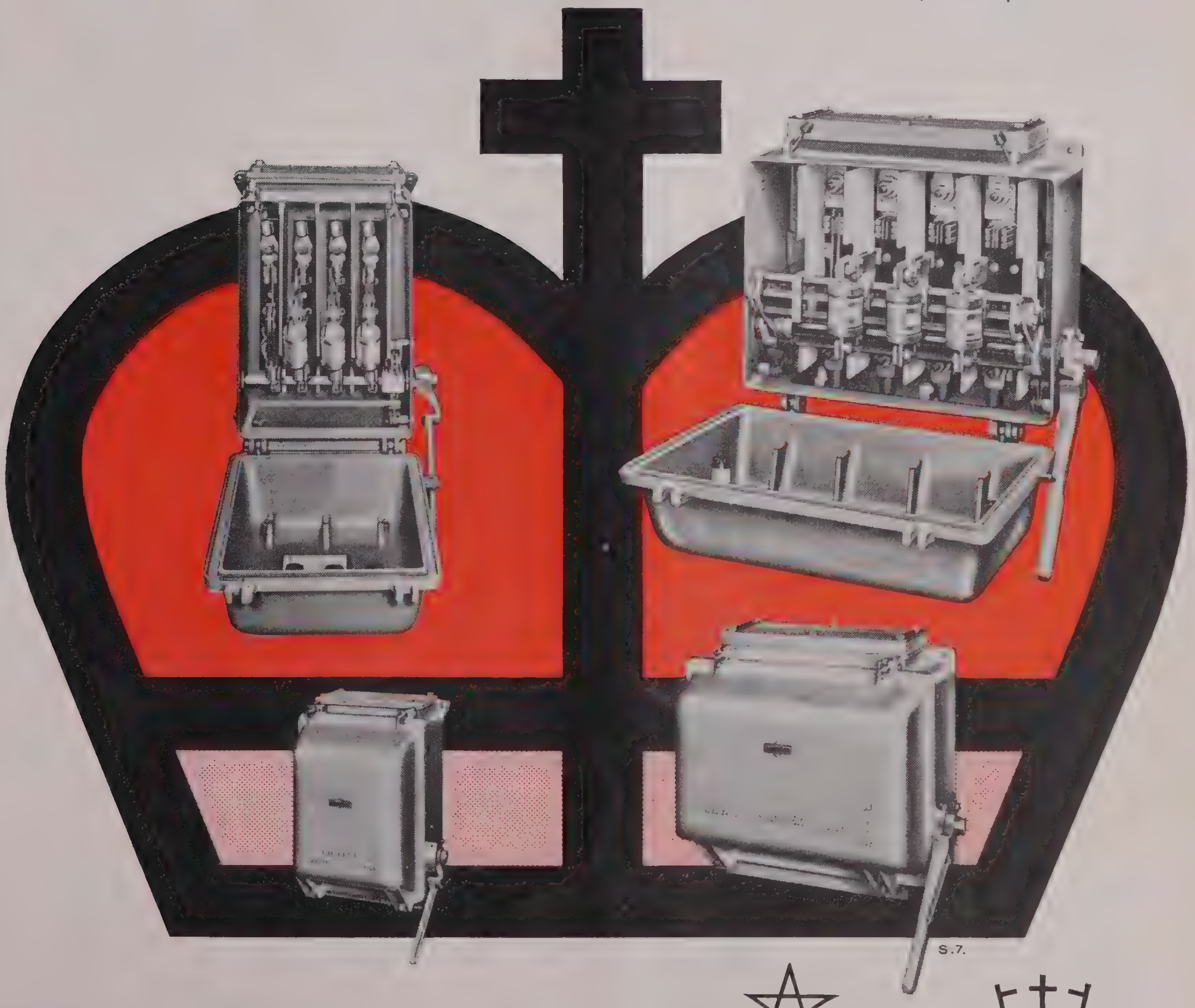
Monarch fuse switches 150, 300 amp. 500 volt.



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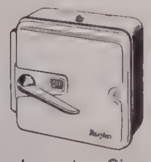
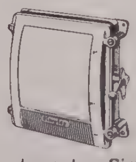
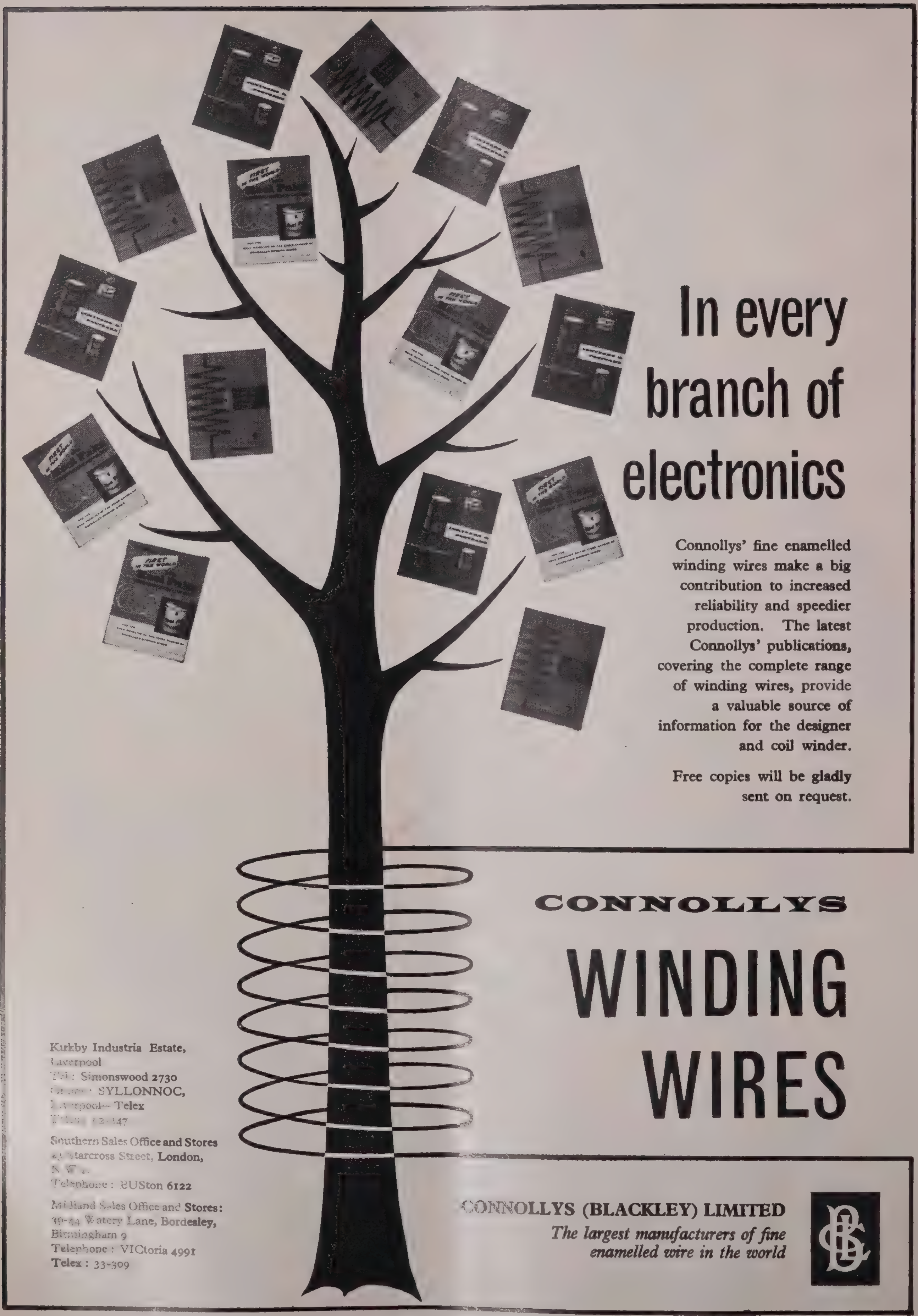


Complementary Simplex Star range. Economically priced, front operated switchfuses In 15, 30, 60 amp. 500 volt. Busbar chambers 200, 400, 600 and 800 amp ratings. 600 volt. Distribution fuseboards 15, 30, 60 amp. 500 volt.



Complementary Simplex Regent range. Robust, stylish switchfuses, 15, 30, 60 and 100 amp. 500/600 volt. Busbar chambers 350, 550, 800 amp. 600 volt. Distribution fuseboards 15, 30 amp. 500 volt.



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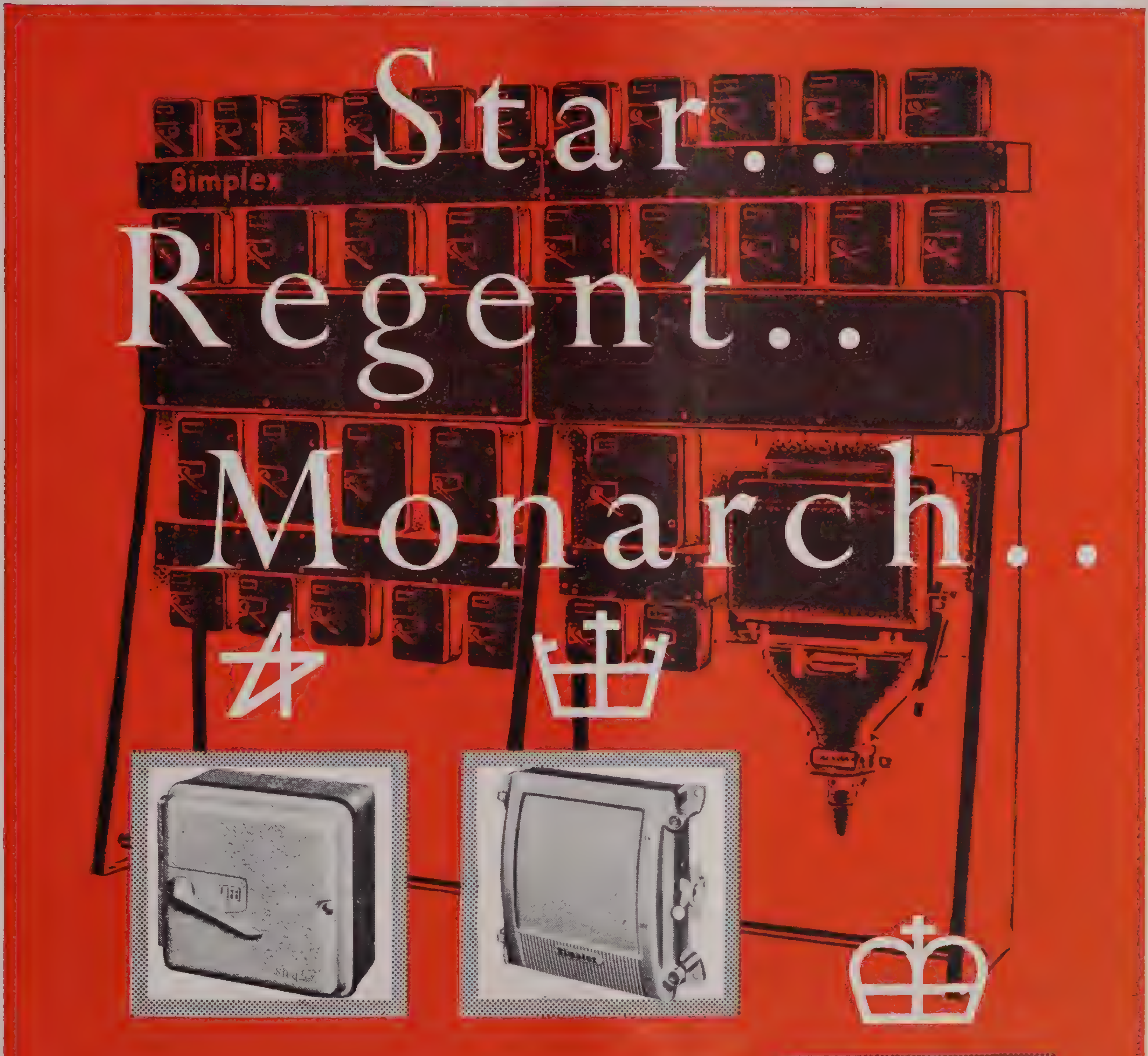

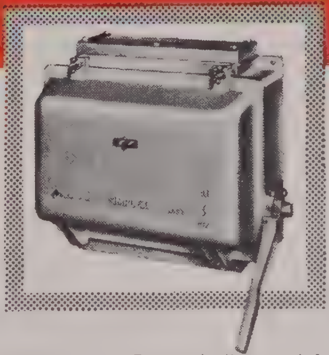

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THE SIMPLEX RANGE COVERS EVERY *M. V.* SWITCHGEAR REQUIREMENT

Whether you judge by sheer value for money, by design or by unsurpassed technical reliability, Simplex make switchgear that leads the industry. The challenging up-to-date competitive Star range is cleanly styled in pressed steel cases ; the conventional Regent in cast-iron and composite metals ; and the heavy duty Monarch is clad in all cast cases. All three ranges comply with latest BS specifications, are complementary to the others, and can be built up as switchboards to meet any requirement. Technical data and the co-operation of a friendly advisory service is always available.

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Simplex Regent. Robust, stylish switches, switchfuses, changeover switches 15, 30, 60 and 100 amp. 500 600 volt. Busbar chambers 350, 550, 800 amp. 600 volt. Distribution fuseboards 15, 30 amp. 500 volt.

Simplex Monarch. Heavy duty fuse switches, suitable for all lighting, heating and power loads without de-rating. 150, 300 amp. 500 volt

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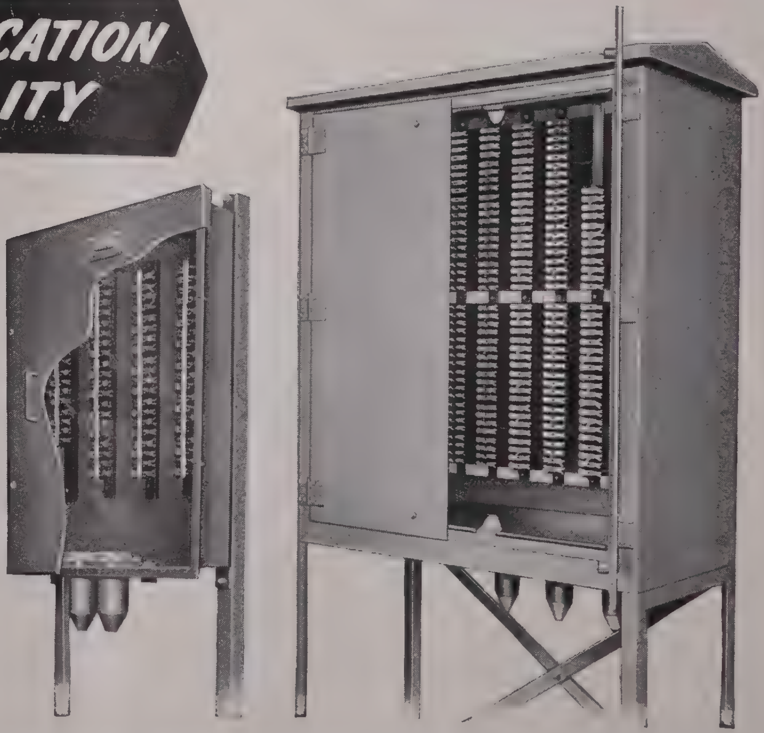

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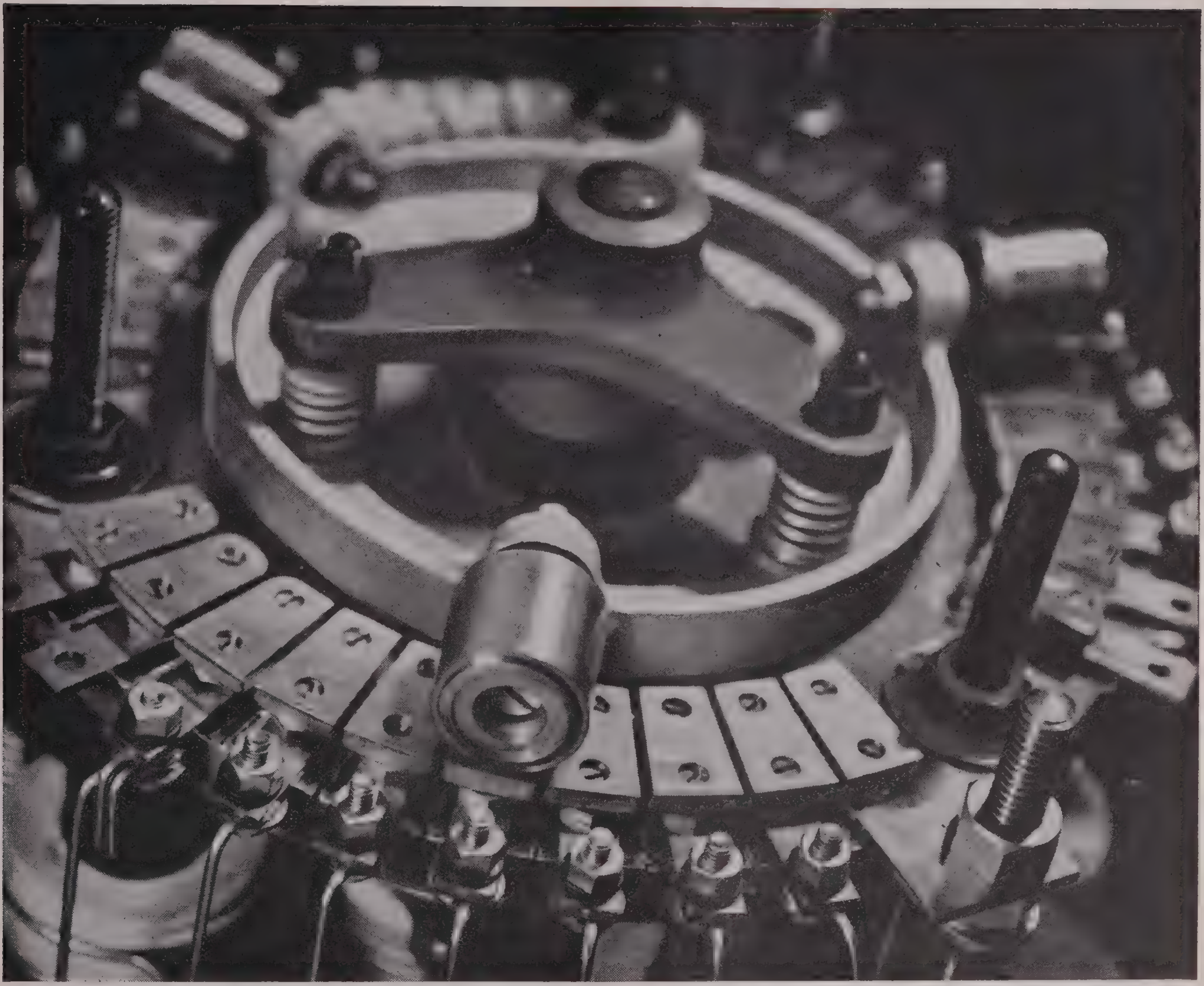

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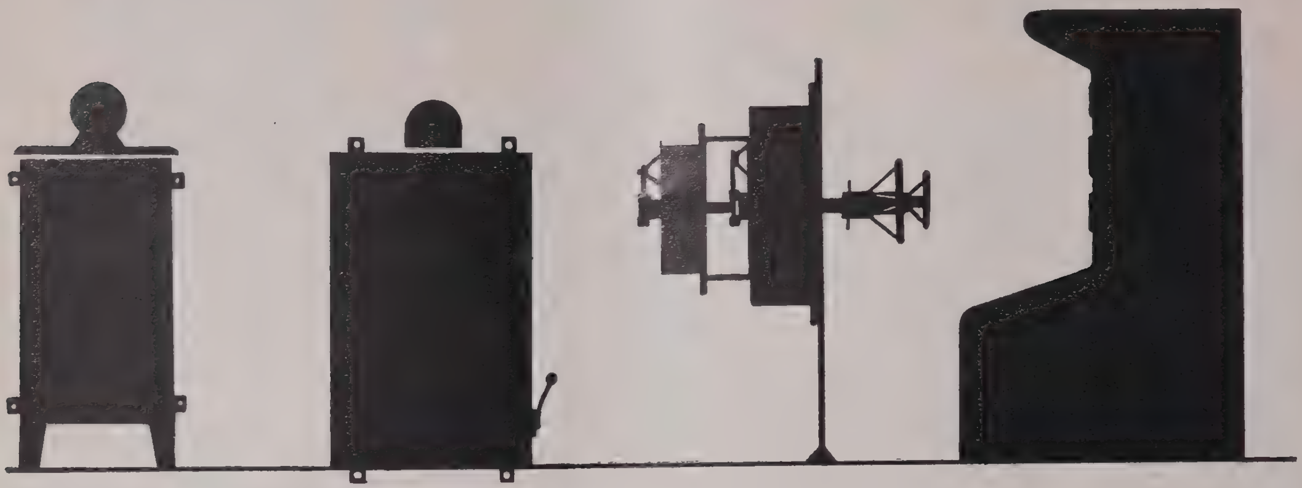

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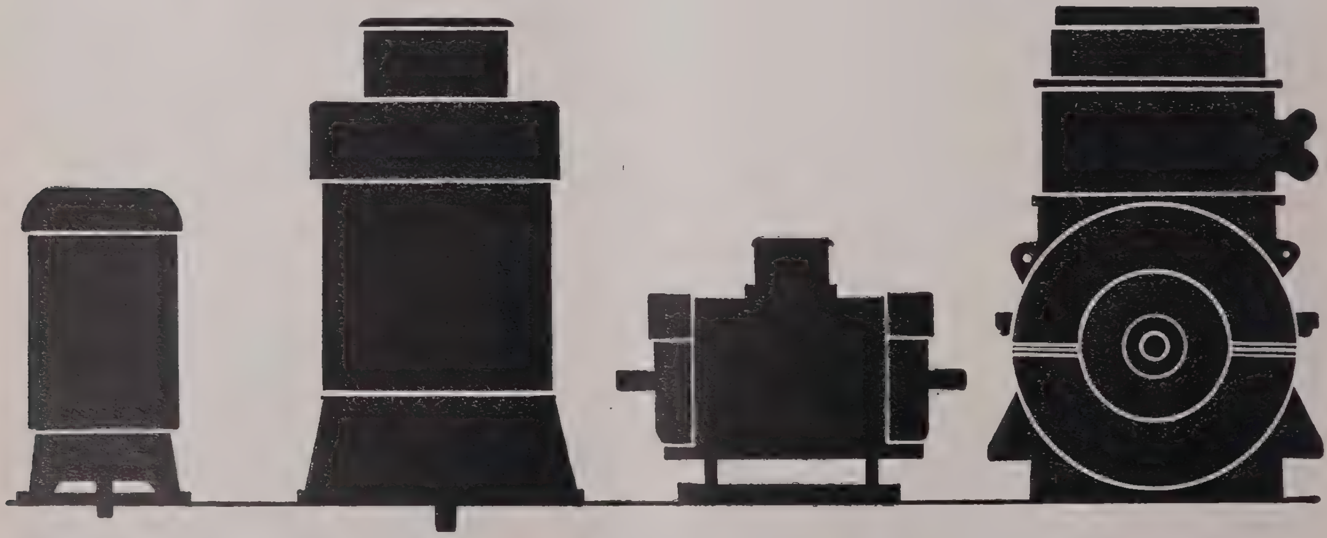

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SINGLE SAFETY FUSEBOX SIZE O

A single pole fusebox for chassis or panel mounting, with facilities for end or rear wiring. The fuse-link is carried in the lid, and is therefore exposed and automatically withdrawn from circuit as the lid is raised, permitting replacement in complete safety. A spring retaining clip prevents accidental disengagement of the lid under vibration.

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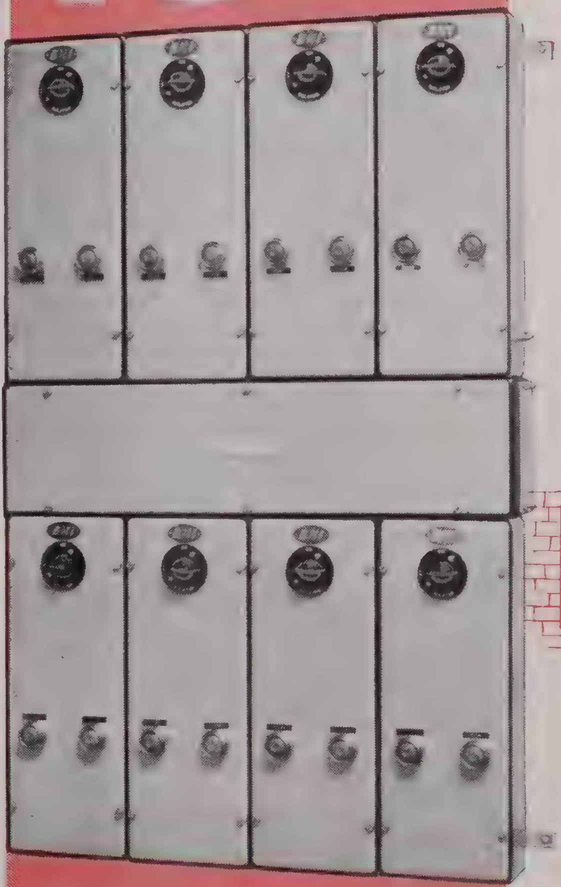

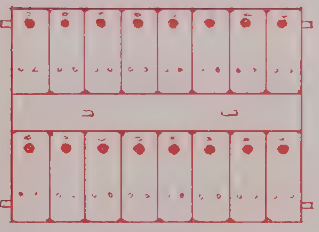

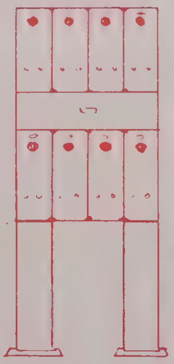

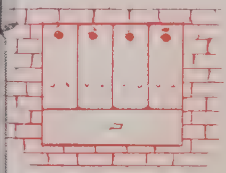

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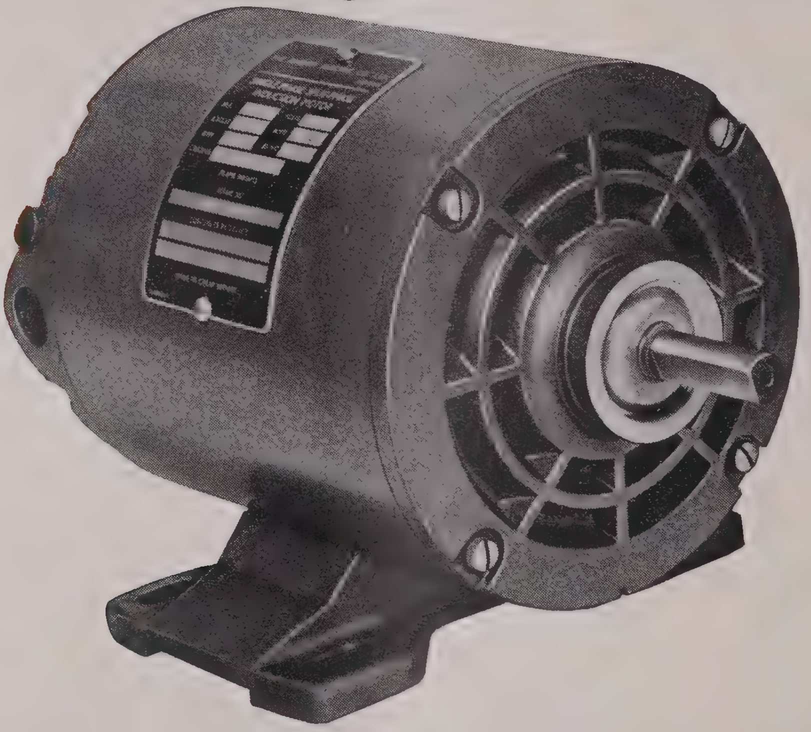

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HUGH S. POCOCK, M.I.E.E.

General Editor:
J. H. COSENS

Technical Editor:
A. R. POLLARD, A.M.I.E.E.

Iliffe Electrical Publications Ltd.

Managing Director H. S. Pocock, M.I.E.E.

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ELECTRICAL REVIEW

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Automatic Control in Aviation

THERE can be scarcely any field of engineering today in which the automatic control of plant or processes is not firmly established or which is not being subjected to the closest scrutiny to ascertain the manner in which this technique could best be employed in improving efficiency and reducing costs. Certainly electrical engineers are as familiar as anybody with these principles, as the great majority of automatic control systems are electrical. The electrical power industry itself is exploiting the possibilities of automatic control. Work is being done, we understand, on the simplified control of a turbo-generator set at South Denes, while a high degree of " automaticity " has been achieved in the boiler control at Little Barford and the system is also being applied at West Thurrock.

A sphere of technology which has been even more profoundly affected by the concept of automatic operation, with manual check, is aviation. This is probably due to the fact that the consequences of human error in the operation of an aircraft can be so serious. The replacement of manual effort, or even its monitoring, by some item of less fallible machinery, has long been considered desirable, and recent developments have indicated that the situation is being approached where the normal method of control will be an automatic system with human surveillance and intervention only in some emergency. Many of these developments will be on view next week during the annual air show and exhibition organised by the Society of British Aircraft Constructors at Farnborough.

The introduction of automatic controls into every phase of flying, and their integration into a single comprehensive system, is assured. The first major step was taken many years ago with the development of the autopilot. As soon as this had reached the desired stage of proficiency, the possibility of automatic landing, in addition to control during cruising, was considered. A successful system was produced by the Royal Aircraft Establishment's Blind Landing Experimental Unit and this has since accomplished over 5,000 landings of jet and piston-engined aircraft in all weathers. Autopilots, to be shown on the Smiths Aviation Division stand, designed for fully automatic landing will be fitted in the new De Havilland *Trident* airliner. Initially, these will not be fully exploited, but the aircraft will be certified for auto-flare when it enters service with British European Airways. Further, no ground-guidance installations are required other than accurate ILS (Instrument Landing System) localiser and glide path transmitters. A conventional approach is made under autopilot control down to a height at which the runway can be seen, whereupon the aileron channel is switched out and the aircraft is steered manually to keep it aligned with the runway, the autopilot retaining control in pitch until touchdown. Another aircraft which will be equipped with automatic landing facilities will be the Vickers VC10, and units from its flight control system will be shown by Elliott Brothers (London), Ltd.

This company is also concerned with the application of digital computers, both in the air for navigational control and fuel management duties and on the ground as the basis of air traffic control systems. Several other companies have been attracted by the possibilities of computers; for example, the G.E.C. are carrying out a programme of flight trials with an airborne digital computer known as " Dexan," and a Ferranti " Apollo " computer is expected to begin operation at the Scottish air traffic control centre at Redbrae, Prestwick, later this year. Computers may well prove to be the foundation of the next major developments in automatic control in aviation, but whatever materialises, progress in this field will be of considerable interest to all concerned with non-manual control in any sphere.

ON THE ROAD

Some form of automatic control could well be applied to road transport. The annual report of the Road Research Board, summarised on page 326, gives details of ways in which electrical equipment is being considered for vehicle detection and traffic light control. Reference is also made in the report to the new research track at Crowthorne, Berks, which is equipped with a network of guidance cables and detector loops for studying electronic vehicle control systems. In America, a system has been demonstrated in which two specially equipped cars were guided automatically round a test track, accelerating, braking and maintaining a safe distance between them in response to signals from the road. Such equipment can be used to inform drivers of dangerous conditions and experiments at Crowthorne will investigate its use for assisting drivers in fog, for speed measurement and for the operation of excess speed warning signs.

Automatic control will undoubtedly be considerably more difficult to apply to road vehicles than railway trains, or even other " free moving " machines such as aircraft and ships, because of the higher traffic density. Nevertheless, there seems every possibility that some form of electronic assistance for drivers is likely in the future, if only in the more dangerous situations.

MINES AND RAILWAYS

As a result of the British Railways' programme of main line electrification it has become necessary to electrify certain colliery sidings to provide facilities for electric locomotives coming into them. In the case of the Kent Coalfield the electricity supply has been taken from the railway system, but as the Southern Region normally use a live third rail near ground level, it has been found necessary in the interests of safety to use overhead line transmission in the sidings. In the future, it is likely that many collieries, and maybe quarries, throughout the country will be served by electrified railways, but only where the third rail is used should any problem arise.

This interesting sidelight on railway modernisation is referred to in the annual report of H.M. Chief Inspector of Mines and Quarries for 1960. The report also says that there were no fatal accidents due to electricity during the year. The large number of accidents during 1959 involving electricians was, fortunately, not repeated. Many of these were due to the use of short pieces of wire to connect the pilot pins of outgoing sockets on gate-end switches to earth. The use of test-plugs is, however, increasing and this should reduce the temptation to test by unsuitable means. The provision of a " test position " on the gate-end box isolator is possibly a better solution.

E.T.U. AND T.U.C.

It seems certain that the Trades Union Congress at its next week's gathering at Portsmouth will accept the recommendation of its General Council that the Electrical Trades Union shall be expelled from the T.U.C. This drastic step follows upon the refusal of the E.T.U. to institute certain reforms shown to be necessary in the course of the recent protracted legal action taken against officers of the union. In the view of the General Council the way in which the union has been run, particularly in the matter of the election of officials, has been detrimental to the movement.

While recommending the expulsion of the E.T.U. from Congress the General Council has left the way open for its return to the fold if, after all, reformation is accomplished. On several grounds the Council's decision was taken very reluctantly. For one thing, the E.T.U. with a membership approaching a quarter of a million, with an appropriate contribution to Congress funds, is an important constituent of the T.U.C. This, and the mere fact that its exclusion obviously weakens the T.U.C. generally, makes it desirable that the union should be re-admitted as soon as it makes this possible. It is up to the members to bring about the necessary changes—if indeed they think that they are necessary, a matter about which there seems to be some doubt.

LIGHTING ISSUE

The Annual Lighting Issue of the *Electrical Review* will be published next Friday. Trends influencing present developments in this field will be dealt with by leading experts in a symposium of five articles and descriptions of modern lighting practice in a new liner, in offices and on the stage will be illustrated in colour

AVIATION ELECTRICAL EQUIPMENT

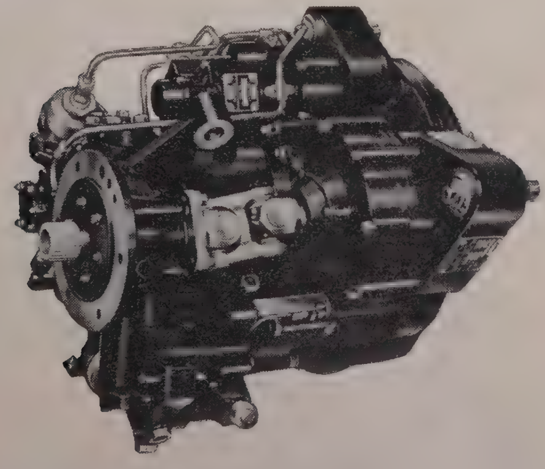
S.B.A.C. FARNBOROUGH EXHIBITION PREVIEW

English Electric Lightning aircraft of No. 56 Squadron, R.A.F. Photograph by courtesy of "Flight"

Several new developments in aircraft and airfield electrical installations will be on view at the S.B.A.C. exhibition and flying display to be held next week at Farnborough, Hants. Principal items of interest to electrical engineers are the aircraft power systems with their constituent generators, switchgear and cables; aircraft and airfield lighting; and ground power units

NEXT week, the annual flying display and aviation equipment exhibition organised by the Society of British Aircraft Constructors (S.B.A.C.) will be held at the Royal Aircraft Establishment, Farnborough, Hants. Admission from the 4th to 7th September will be restricted to trade visitors, but the exhibition will be open to the general public on the last three days (8th-10th September) from 10 a.m. to 7 p.m. The flying display, which starts at 3 p.m. on these three days, will contain the latest civil and military aircraft, and as usual will be supported by the static aircraft exhibits, outdoor displays of missiles and airfield appliances and the covered exhibition of aeronautical components.

Although covering all aspects of aviation and its associated field of engineering, this show also contains a high proportion of items of electrical interest and provides an excellent opportunity to keep abreast of development in aircraft electrics. Last year we commented on three apparent trends—the move towards constant frequency a.c., reduction in size and weight, and elimination of moving parts. The last two of these are still apparent but the first is less noticeable, despite the fact that the first British airliner to have a constant frequency primary electrical system, the De Havilland "Trident," is nearing completion. This is due largely to the refusal of other systems—d.c. and frequency-wild a.c.—to be superseded and it seems that designers have now decided that each system has its merits and should be used where appropriate. Certainly combinations of two or even three systems can be found in most major aircraft. One point which is clear is the increasing size of electrical installation, using both larger individual units or an increased number.



English Electric 57 h.p. constant speed drive for use on Boeing 707 aircraft

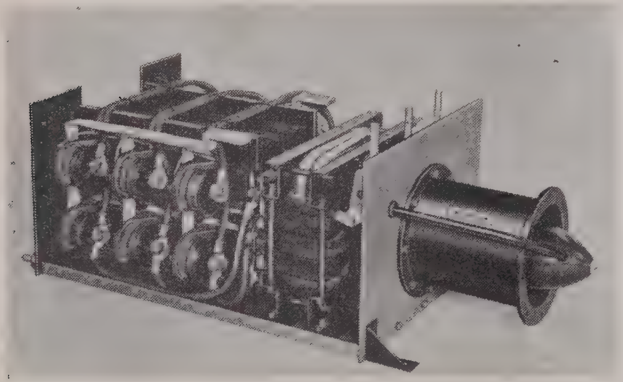
Power Systems

One stand which will illustrate the alternative electrical power systems available to aircraft designers will be that of Associated Electrical Industries, Ltd. This will be divided into two main classes of apparatus, a diagrammatic layout on one side of the stand showing the principal components of a d.c. power system for an aircraft and a similar layout on the other side illustrating those of an a.c. system. Both layouts will include all the equipment required in a single generating channel up to the main busbars. Associated with each layout will be examples of d.c. and a.c. equipment and components suitable for use in either system.

Being shown for the first time by the English Electric

Co., Ltd., will be a constant frequency power system. This will comprise a 38 h.p. constant speed drive which has an input speed range of 3,100-7,950 r.p.m. and an output speed of 8,000 r.p.m. The overload capacity is 57 h.p. for five minutes and 76 h.p. for five seconds. The 30 kVA, 200 V, three-phase, 400 c/s brushless generator has an overload rating of 40 kVA for ten minutes. The static control unit maintains the voltage under steady-state conditions of load and speed to within 195-205 V, has over-under voltage protection and checks line-to-line and line-to-earth faults. A three-phase magnetically latched contactor unit connects the generator to the busbars. The drive, including oil tank and cooler, generator, combined static control and protection unit and the contactor, weighs 179 lb.

A 55 kVA frequency-wild system will also be shown, comprising a 200 V, three-phase, 400 c/s brushless generator with a speed range of 8,000-9,800 r.p.m. and an overload rating of 80 kVA for one minute. Another new development to be seen on this stand will be British built Sundstrand constant speed drives for Boeing 707 aircraft. These maintain a constant output speed of 6,000 r.p.m. with varying engine input speeds and will accept an 85 h.p. overload for five minutes and a 114 h.p. overload for five seconds.



A.E.I. transformer/silicon rectifier unit for operating on a 200 V 250/500 c/s supply and delivering 500 A at 28 V d.c.

An aircraft power system to be shown by the Plessey Co., Ltd., is similar to that being installed in the Vickers VC10 and proposed for the BAC 111. The system comprises a 40 kVA brushless generator, a voltage regulator, a control panel and a current transformer package and embodies transistorised control equipment. Also on show on this stand will be a 2 kW transformer/rectifier unit capable of operation in temperatures from −40 to +70°C and at altitudes up to 50,000ft. Static convertors exhibited this year on this stand will include a type for airborne or ground use. With loads of 20 to 120 VA this unit has automatic overload shutdown at 140-150 VA and restarts when the load is reduced to the normal value. It is suitable for operation from a 25-29 V d.c. input and has an output of 110 and 230 V, 50-65 c/s.

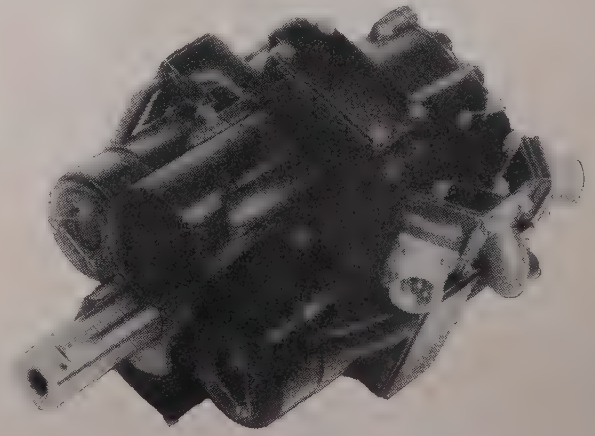
A number of new items will be shown by Rotax, Ltd., including a range of 400 c/s static invertors utilising silicon-controlled rectifiers. The range includes 225 VA, 1 and 3 kVA units for use in three-phase systems, and 75 VA, 350 VA and 1 kVA invertors for use in single-phase systems. These ratings have been obtained without using semiconductor elements in parallel. Also new is a wide speed range brushless alternator having a continuous rating of 208 V, 144 A at 6,400 r.p.m. with a power factor of 0·8. An overheat detector is built into the alternator which is cooled by blast air and an internal fan. Other items on view for use in conjunction with this generating equipment will be a static voltage regulator using silicon semiconductors, an over-voltage protection unit for 208 V, three-phase, 400 c/s systems, a control and protection unit for use with transformer/rectifier units and a control unit containing a 50 kVA, three-phase, change-over contactor. Among the actuators which will be shown on this stand is a three-motor linear unit. Two motors are identical and operate from a 28 V supply. The third operates at 115 V, 400 c/s and is normally used in conjunction with a servo mechanism. With either of the d.c. motors operating, the ram speed is 0·086in/sec at an average load of 250 lb. With the third motor operating the ram speed is reduced to 0·0086in/sec at the same load.

An auxiliary airborne power plant to be shown this year by Rover Gas Turbines, Ltd., has been designed for freight-carrying aircraft and is for use both on the ground and in the air to provide power for ground service checking, winch and door operation, loading, main engine starting and as an emergency power unit when airborne. It basically comprises a single-shaft 65 h.p. gas turbine driving a Rotax 28 V, 9 kW generator through gearing at 4,500 r.p.m., an integral hydraulic pump and any other auxiliary through a third output driving flange. For starting the gas turbine, the generator is connected to the aircraft batteries and is used as a starter motor.

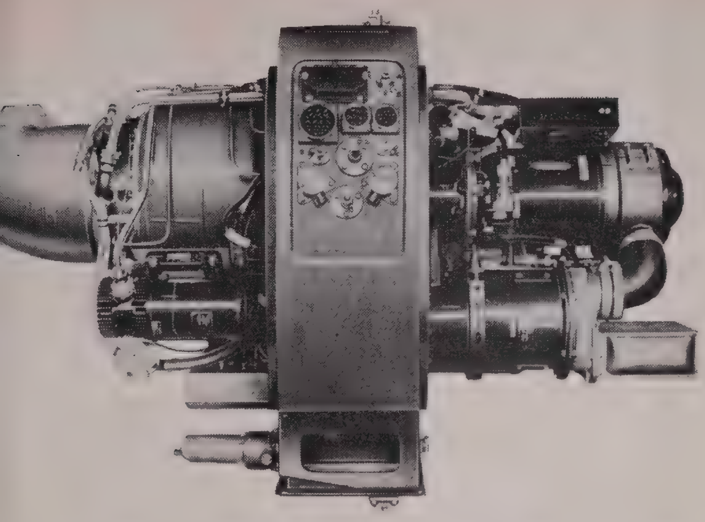
Two applications of "Trinistor" silicon-controlled rectifiers will be demonstrated by the Westinghouse Brake & Signal Co., Ltd. One is a power invertor producing an output at 400 c/s with a truly sinusoidal waveform; the other is a compact h.c. power regulator rated at 13 kVA and incorporating a fan for forced air cooling. Among other semiconductor devices to be exhibited will be silicon diodes rated at from 750 mA to 175 A with peak reverse voltages of 100 to 1,200 or 1,800, and silicon-controlled rectifiers rated at 16 and 26 A at 400 V peak.

Switchgear

All aircraft components, including switchgear, must be reliable and of minimum weight and size. With regard to relays and circuit-breakers, there is the additional problem that the reduced atmospheric pressure at high altitudes increases the difficulty of arc extinction. Under these conditions, the sealed relay has definite advantages.



Three-motor linear actuator by Rotax, Ltd.



Airborne auxiliary power unit comprising a Rover gas turbine driving a Rotax 9 kW generator and an hydraulic pump

A range of hermetically sealed relays, the series BR, will be exhibited by "Diamond H" Switches, Ltd. These relays have a four-pole, double-throw, electromagnetic switch and the coil is suitable for operation on d.c. The relays can also be supplied for use on 115 V, 400 c/s and 200 V, 400 c/s by the incorporation of silicon diodes within the coil assembly. Armature movement at the pole face end of the magnet is transmitted by the plunger through the centre of the coil to the switch assembly which is screwed into the magnetic core at the opposite end of the pole face. The use of flexible conductors has been completely eliminated in the switch assembly since the fixed contacts are hard soldered directly to the terminal pins. Contact pressure is provided by stainless steel coil springs which do not carry the load current. All the terminal pins are glass sealed into a steel header plate, to which the cylindrical housing is soldered prior to evacuation and sealing. Various mounting arrangements are available and contact ratings are for resistive loads up to 10 A and inductive loads up to 5 A. The relays weigh about 4 oz. The range of "Ugon" sub-miniature hermetically sealed electromagnetic relays developed by Le Prototype Mécanique, of Paris, will be shown by Vactric Control Equipment, Ltd.

A number of new items of switchgear will be shown by Rotax, Ltd. These include a three-phase static contactor utilising semiconductors for the switching action. They are suitable for switching 200 V three-phase over the frequency range encountered in general aircraft applications. The contactor operates from a 24 V supply and is rated at 16 A, up to 70°C ambient, and from sea level to 20,000ft. Other items to be shown include static cyclic timers, designed primarily for the control of engine de-icing systems, and generator switching units, comprising a differential relay and contactor combined, which will switch a generator on to a busbar when the generator voltage exceeds the busbar voltage by from 0·3 to 1 V and disconnect the generator when its output is sufficiently reduced to cause a reverse current of from 20 to 30 A to flow. A four-pole latched relay designed as a field relay for undervoltage protection and for general application in aircraft 28 V d.c. systems will also be shown as well as a latched contactor designed to make and break a 208 V, 14 A, three-phase supply with provision for manual and remote tripping.

A new range of small toggle switches will be shown by Associated Electrical Industries, Ltd. These are available for single-, double- and triple-pole applications for ratings up to 20 A in either a.c. or d.c. circuits and can be supplied with a variety of operating mechanisms, so that they can be locked in any position, spring biased to any position, or have a simple on/off action. There are also designs in which a small indicator lamp is included in the operating dolly. All toggle switches incorporate wipe action double break, and are sealed against the ingress of moisture. A.E.I. will also show some new single- and triple-pole circuit-breakers operated by a push-pull button. These are available to protect all cables with ratings up to 35 A in 28 V d.c. circuits and up to 20 A in 400 c/s a.c. circuits. The triple-pole versions can be provided with an additional protection feature designed to trip the breaker should any one of the three lines become open-circuited.

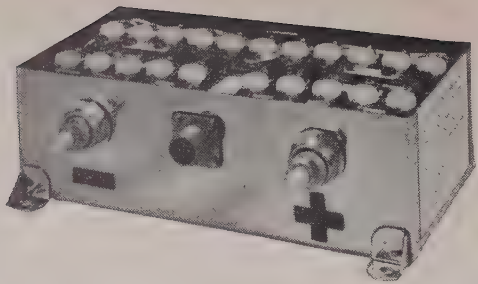
Cables

The latest variants of several types of aircraft wiring cables will be displayed on the British Insulated Callender's Cables, Ltd., stand. These include the Efglas cables which are suitable for operation up to a maximum of 600 V r.m.s. and 2,400 c/s over a temperature range of −75 to +240°C. In these cables, the insulation consists of a matrix of glass fibres and p.t.f.e. The Nyvin cables to be shown are insulated with heat-resisting p.v.c. dielectric compounds, braided with glass and finished with either a nylon sheath or a nylon braid and lacquer. These cables are resistant to all aircraft engine oils and fuels and are suitable for use at stabilised conductor temperatures up to 105°C. Nyvin cables are the lightest in the range of aircraft wiring cables. Tersil cables comprise nickel-plated annealed copper conductors insulated with silicon rubber, glass braided and terylene taped and braided, and compounded with a special fluid-resistant lacquer. This type of cable is of lightweight construction and suitable for use over a working temperature range of −55 to +190°C. They have a good resistance to abrasion. The construction of the well-proven Pren cable incorporates glass braid and p.c.p. insulation having high resistance to flame. To give protection against ester-based lubricants or active hydraulic fluids, Pren cables are supplied with a nylon sheath or nylon braid or lacquer over the p.c.p. insulation, this type being known as Nypren. Other cables to be shown include those specially designed for essential services and fire-detection circuits which must continue to operate during or after a fire. The continuous operating temperature range of these cables is from −50 to +240°C.

New components introduced by Belling & Lee, Ltd., since the last Farnborough exhibition include additions to the series of miniature and sub-miniature coaxial connectors, fuse links for semiconductor rectifier protection, an improved range of miniature wander plugs and sockets, a flexible terminal box and a variety of items for printed circuit applications.

Batteries

Two methods of ventilation for batteries will be demonstrated on the Joseph Lucas, Ltd., stand. For aircraft with pressurised systems, battery ventilation is via the



Venner type PN 3550/1 aircraft battery

battery lid and for forced draught extraction, side tubes are used. Non-ventilated batteries will also be displayed on this stand as well as silver oxide/zinc batteries for special application demanding high power/weight and power/volume ratios.

Lightweight silver-zinc and silver-cadmium aircraft batteries in hermetically sealed units for missile applications, electronic and communications equipment will be shown by Venner Accumulators, Ltd. One example is the type P.N.3550/1 battery which provides power for operating ancillary equipment in an emergency. Pritchett & Gold and E.P.S. Co., Ltd., will be featuring their Dagenite 24 V battery for a variety of civil aircraft. This type E.D. battery weighs only 53 lb when filled and has an output of 25 Ah at the one-hour rate of discharge. The wide range of batteries to be seen on the Chloride Batteries, Ltd., stand includes a leak-resistant unit dry cell, type T.22, capable of giving relatively high discharges for very short periods. Dry cells and batteries will also be seen on the Burndept, Ltd., stand.

De-icing

The principal "Spraymat" exhibit on the stand of D. Napier & Son, Ltd., will be a complete prefabricated helicopter heater mat which was tested on the rotor blades of a Westland "Wessex" helicopter during de-icing trials in Canada last year. Associated equipment, including a helicopter ice detector and cyclic switchgear, will also be on display. The company will give prominence this year to the "Sierracote" process for electrically heating aircraft windscreens and canopies. A demonstration of its infra-red properties will be given in conjunction with a working display of a new high-temperature heater mat.

Another de-icing demonstration will be that on the Triplex Safety Glass Co., Ltd., stand, in which three of the five windows in a Vulcan canopy will be allowed to ice up, the other two being kept clear by electrical de-icing. To produce icing conditions, fans will blow air which has been cooled to below −25°C on to the canopy. The heated windows are supplied at up to 900 W/sq ft through thin gold elements.

Lighting

A new system of controlled aircraft cockpit and instrument lighting to be shown by the General Electric Co., Ltd., allows the illumination intensity to be continuously varied from full brightness to complete extinction by a simple circuit using transistors and silicon-controlled rectifiers operating from the 115 V, 400 c/s aircraft power supply. Another example of aviation lighting equipment being shown by this company is the new deck landing projector sight developed in conjunction with the Admiralty by the company's Hirst Research Centre. The optical system of this unit comprises a vertical bank of twelve projectors each giving a beam of small vertical spread. Horizontally, the beams are spread over 40° so that the pilot can pick up the indication as he turns on to the final approach. Vertically, the twelve beams are set at intervals of eight minutes of arc so that the total vertical spread is about $1\frac{1}{2}$°. The beams are orange coloured and the effect of the small angular separation is such that a pilot on the correct glide path will see only the two centre beams as orange lights. To assist him in identifying the centre, a row of six green lights, three each side of the vertical bank, is arranged horizontally on the centre line and forms a datum. In addition, there are two red "wave off" lights used to indicate that a safe landing cannot be made and that the aircraft must circle for another approach. Other exhibits on this stand will include a visual glide path indicator system and aircraft galley equipment.

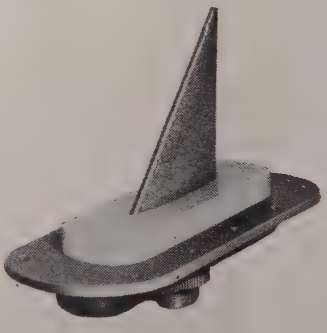
Exhibited by the A.E.I. Lamp & Lighting Co., Ltd., will be the Mazda visual glide path indicator system which uses a sealed beam lamp and was developed by the R.A.E., Farnborough. Also on display will be the Mazda 200 W linear sodium lamp which has an integral transparent oven and when placed in a simple reflector system can give from under 200 up to 20,000 candles in a beam extending 8° vertically and 60° horizontally.

Navigation

A multitude of navigational aids of various types will, of course, be displayed at Farnborough. In general, these systems can be divided into those which require ground facilities and those which do not.

The former methods are dependent on radio signals giving bearing or distance measurement, while the dead reckoning type of navigation system, which does not depend on any ground facilities, uses either the Doppler effect to measure distance moved from a datum by computing the integration of the ground speed or the inertial navigation system which is based on the measurement of acceleration. One of the main features of the Ferranti exhibits will be a new intermediate size stable inertial platform. The platform carries three accelerometers and is stabilised by three flotation type gyros. Synchros on the gimbals supply altitude and heading information and inertial velocity is derived by integrating the accelerometer outputs. Doppler navigation systems will also be seen on the Marconi and Elliott stands.

Among equipment displayed on the stand of Cossor Radar & Electronics, Ltd., will be components of the Cossor civil secondary surveillance radar system, which in June of this year successfully completed acceptance tests by the Ministry of Aviation at London Airport. In this system, a transmission from the ground interrogates the airborne transponder which then replies with a train of pulses. Different pulse combinations are available and



Cossor civil secondary radar transponder aerial these are used as codes to convey information from the aircraft to the ground. The ground equipment decodes the pulse combination and presents the information to the air traffic controller. At the same time, the usual plan position indicator presentation provides range and bearing information for the same aircraft. In the equivalent primary radar arrangement, a transmission from the ground is reflected by the aircraft back to the ground equipment. The range and bearing of the aircraft can be determined with this system, but its identity cannot be established. On the Ministry of Aviation's main stand the present airways system, radar coverage and navigation aids are to be shown.

Instruments

The newest and smallest instruments in the range of equipment to be seen on the Measuring Instruments (Pullin), Ltd., stand will be their miniature edgewise ammeters and voltmeters which have a 1in scale. These instruments are housed in phenolic resin cases and are available with current scales up to 50 μA and 500 mA and voltage scales up to 250 V. The a.c./d.c. convertor to be shown by Blackburn Electronics, Ltd., is designed for operation in conjunction with digital voltmeters and other d.c. measuring instruments to permit precise a.c. measurement to be made. It converts a.c. signals in the range of 25 c/s to 30 kc/s to a d.c. voltage proportional to the peak value of the signal to be measured with an accuracy of 0·1 per cent of full scale. Digital voltmeters, including a transistorised model, will also be on display on this stand.

Transistorised tachometers working from a photo-probe or magnetic pick-up will be displayed by Southern Instruments, Ltd. Both these tachometers will operate from either a mains or an external 12 V battery supply. Rotation speeds in three ranges are clearly indicated on the 6¾in circular scale. Pick-up voltages produced by either probe are converted into pulses of constant area. The average current through the meter is proportional to the number of such pulses and is therefore a measure of shaft speed. The accuracy is essentially that of the meter which is 1 per cent of full-scale deflection. Grundy & Partners, Ltd., will be showing a thermocouple amplifier specifically intended for the measurement of temperature rise above ambient. This is ideal for transistor heat sink measurements and transformer or equipment temperature rises.

Ground Power Units

The use of brushless generators to eliminate interference with an aircraft's radio and radar installation during servicing or engine starting is featured in two new ground power units which will be shown by Houchin, Ltd. The smaller of these two trailer-mounted sets, known as the "Recti-Cy," comprises a six-cylinder Perkins diesel engine rated at 79 h.p., 1,800 r.p.m. continuously and 87 h.p. intermittently, directly driving a revolving field, salient-pole, two-bearing generator having an output at 20-30 V, six-phase at 240 c/s. The output from a three-phase a.c. shaft-mounted exciter is fed into the alternator main field winding through a three-phase full-wave bridge rotating silicon rectifier. The controlled output from the alternator is taken to the main silicon rectifier, which is air-blast cooled and gives an output controlled to 28 V, ±1 per cent. A continuous output of 700 A is available for aircraft servicing and 1,500 A can be drawn for engine starting. The second unit, the "Recti-Hy-Cy," contains two brushless generators driven at 1,500 r.p.m. The 60 kW machine can supply an aircraft at 120/208 V, three-phase, 400 c/s or, when feeding through a rectifier stack, at 112 V, ±1 per cent, with loads of 300 A continuously or 900 A intermittently. The second generator has a 200 c/s output which is taken through a rectifier stack to give 28·5 V d.c., ±1 per cent, the rating being 1,200 A continuously or 2,500 A intermittently.

A prototype trailer-mounted aircraft starting and servicing unit with a three-phase a.c. and two d.c. outputs will be shown by Auto Diesels, Ltd. This unit incorporates a six-cylinder A.E.C. diesel engine continuously rated at 165 h.p. at 1,850 r.p.m., directly coupled to two Macfarlane "Magnicon" generators of the screen protected revolving field type. These machines are excited by two belt-driven exciters and are controlled from three-phase transformer, rectifier and bridge networks using zener diodes to give an output regulation of ±2½ per cent at all loads and power factors from 0·75 lagging to unity and between 0 and 10 kVA at 0·2 power factor leading. Both machines have Class E insulation. One is continuously rated at 60 kVA, 208/120 V, three-phase, 400 c/s and has an overload rating of 66 kVA. The second machine is rated at 120 kVA, 60/105 V, three-phase, 185 c/s and feeds transformers and rectifiers to provide the two d.c. outputs from the unit. The 28 V output has a continuous rating of 21 kW, and an overload rating of 70 kW for six ten-second periods with 60-second intervals. The second output is at 112 V and has a continuous rating of 44·8 kW and an overload rating of 95·1 kW for four five-second periods with 60-second intervals. The maximum simultaneous rating is 100 kW. The unit is complete with voltage control equipment, metering switchgear and protective gear.

Ground power unit by Murex Welding Processes, Ltd.

Two ground power units will be shown by Murex Welding Processes, Ltd. One of these, the type 8940, comprises a six-cylinder 80 h.p. Perkins diesel engine driving a generator at 1,650 r.p.m., at which speed the generator output is 600 A at 28 V continuously or 700 A at 28 V for 15 minutes, or at 2,300 r.p.m. when the generator can provide 2,000 A at 28 V for two seconds. The generator is of the shunt-wound compensated type with Class E insulation.

The G.E.C. Moves Towards Specialisation

AN INTERVIEW WITH MR. T. B. O. KERR

SINCE Mr. Arnold Lindley became its chairman at the beginning of this year major changes have taken place in the organisation and outlook of the General Electric Co., Ltd. The process of adaptation to changed conditions in the electrical industry involves not only the decentralisation of management but a thorough review of product policy.

Ultimately the success of the new approach will be judged by its effect on profits, and much has been written recently about the G.E.C. from the financial point of view. In the meantime, however, many people within the industry will be interested to know more about the reasons underlying the physical changes in organisation and the altered face which the G.E.C. will present to its customers. In this interview, Mr. T. B. O. Kerr, the deputy managing director of the company, answers a series of questions about the reorganisation of the company put to him by R. F. Masters, a member of the editorial staff of the *Electrical Review.*

* * *

Mr. Kerr, the G.E.C. grew to its present size and importance by pursuing a policy of supplying " everything electrical." How far do you still believe it is necessary or desirable for prestige or commercial reasons for a major electrical company to produce a comprehensive range of products ?

The G.E.C. has a responsibility to maintain the overall character of the company and must therefore participate in developments over the whole electrical field from atomic energy to electronics. But as time progresses the company has got to make sure that these developments lead to profitable business—if they do not they must be cut out.

The policy of " everything electrical " has been made meaningless by time. The G.E.C. is engaged on a very thorough review of product policy. While keeping abreast of technical advances, the new fields which the company will explore will be carefully selected to make the most effective use of resources—human, financial, technical, manufacturing and marketing. Existing activities which have ceased to be rewarding or which do not show adequate growth prospects will be given up and resources thus released devoted to more profitable fields.

The strong tendency towards amalgamation in the electrical industry is accompanied by a decentralisation of management. In the case of the G.E.C., has the main stimulus for change come from internal causes, the need for separate accountability, etc., or have external factors such as the Restrictive Trade Practices Act been a major influence ?

The aim of the G.E.C. reconstruction is to group the company into more manageable units with greater opportunities for advancement. It will provide more jobs with responsibility thus enabling men to stand on their own two feet, and will put staff in more immediate touch with their own top management which will be empowered to take its own executive decisions. In the past, sections of the company were often dispirited at the thought of having to fight for recognition within a colossal organisation. One of the major problems of the electrical industry is the low ratio of profit to sales and investment. Smaller units and separate accountability will give better chances to remedy this state of affairs. In the end the G.E.C. will become a holding company.

The reorganisation of the G.E.C. has already taken several forms. The main manufacturing activities of the company have been divided into autonomous groups; there has been a straight amalgamation with Radio & Allied (Holdings) on the domestic side; on the heavy electrical and nuclear sides there have been agreements to pool resources; and more recently you have " bought experience " in a new field from an American company. What are the factors affecting the choice of method ?

One of the problems facing the electrical industry is that in many sectors its production resources are too large. There has to be some rationalisation and it is this which guides the G.E.C. when seeking either straightforward amalgamation of some of its interests with those of a competitor, for example, the United Power Co., Ltd., or in pooling of resources such as in the case of Richardsons, Westgarth & Co., Ltd.

In the case of Radio & Allied (Holdings), apart from the good profitability of this concern, its acquisition enabled us to strengthen our radio and television side where there is, once we are out of current restrictions, a good steady market and a promising future market in colour television. At the same time, Radio & Allied were seeking means of entering the domestic market and had gathered together for this purpose some very good men of the calibre of Mr. C. F. Richards who is well known within the industry.

So far as the link-up with Thompson Ramo Wooldridge for the development of industrial process control computer systems is concerned, it is sometimes more profitable to buy experience than engage in our own costly research and this was the governing factor in our decision. This is not a new departure for the G.E.C. as its many past acquisitions show. At the same time it is our intention to expand the marketing of our own " know how " over the whole electrical field.

What will be the future management structure ?

The G.E.C., as I have said, will become a holding company controlling the existing subsidiaries plus the new subsidiaries which will take the place of the old groups, e.g. the Lighting and Heating Group will become a subsidiary company with its own board. The managing

Mr. T. B. O. Kerr, deputy managing director, G.E.C., at his desk in Magnet House. Mr. Kerr joined the company in 1930 and was for twelve years personal assistant to Sir Harry Railing. He was appointed secretary of the company in 1949 and was elected to the board in 1952. He became director for finance and administration in 1959 and took up his present position last January

director of a subsidiary is responsible to the chairman and managing director, or his deputy, through the Management Committee. The Management Committee comprises Mr. A. L. G. Lindley (the chairman), Mr. E. Hay Davison (financial director), Mr. O. W. Humphreys (technical director), Mr. R. N. Millar (managing director, Heavy Engineering Company), Mr. A. Weinstock (Radio & Allied Industries) and myself. The words " Division " and " Group " will no longer be used.

How will the G.E.C. sales organisation with its many branch offices be affected ?

The old G.E.C. sales organisation will disappear. Each salesman will no longer handle many different products as in the past. Instead, the company's subsidiaries, which now have responsibility for their own marketing, are recruiting their own specialist sales teams. This will lead to improved co-ordination between sales and production. Obviously this slims down the space required by our branches, and many of the provincial branch offices will become redundant. The property, of course, is very valuable and in most cases we hope to sell, but we may well retain space in some centres or take a lease of the space we require.

Will similar considerations apply on the export side and what will be the position of overseas subsidiaries ?

The overall export policy is obviously a central responsibility. However, the management of G.E.C. exports will be carried out on a group basis and the overseas branch companies will continue to deal directly with the factories. The position of overseas subsidiaries remains unchanged but their manufacturing activities are likely to increase.

Where will the Hirst Research Centre fit into the new organisation? Will there be less emphasis on fundamental problems and more on matters of immediate profitability? Do you see scope for co-operation in research with other electrical firms ?

We dare not let up on our long-term research programme and are not doing so. We need to do more, rather than less, fundamental research. At the same time we try to secure the maximum return from our shorter-term work by being very selective in the choice of programmes. A good deal can be done to keep abreast of technological advances overseas by keeping a close watch on competitors' activities and on their product development. This is supplemented by frequent visits to these countries by our scientists and technical experts. Research units dealing with specific problems, e.g. lighting, will tend to become the responsibility of the subsidiary company handling these products.

There is scope for research with other companies on specific projects which can result in economies. A good deal is already being done through the Electrical Research Association for more pooled research effort with other members of the electrical industry and other methods of collaboration are being explored.

A number of new materials and products are in advanced stages of development. Some of them will certainly appear on the market, or be incorporated in G.E.C. equipments, before very long. Mr. O. W. Humphreys retains an overall responsibility for the Hirst Research Centre and for the coordination of technical development throughout the organisation.

In considering the changes necessary in the G.E.C. you have presumably had some picture of the future shape of the electrical industry. Mr. Lindley has stressed the importance of development in mechanical engineering and in the International Systems Control Company you have said you will be employing fewer electrical engineers than people skilled in the processes it is desired to control. Do you think that the electrical industry will become less easily identifiable as its products become more widely used ?

It is no longer possible to talk of the electrical industry as though it were a single entity. It is many individual industries. For instance, the section providing generating plant and other equipment to the supply industry is clearly and separately identifiable, but other sections are not always so clear-cut. Many of our specialised subsidiaries have nothing to do with the generation of electricity and are therefore more readily identified by the public with the industries which they serve.

Modern industry uses many skills. In addition to engineers we shall need many trained people in production, selling and marketing. We want to attract the well-qualified younger generation for whom opportunities have never been better.

Magnet House is to be pulled down. Will this break the G.E.C.'s long association with Kingsway ?

The G.E.C. is not likely to return to Kingsway, for to move out of Kingsway and then back again would involve two major and costly upheavals; obviously one move only is better.

The company hopes to announce shortly where its new headquarters will be; it is looking at possibilities in those parts of London where the administration of major engineering companies is centred.

The G.E.C. is realigning itself on a regional basis. The Government has indicated that it is most anxious to " disgorge " some of the vast concentrations of working population in the centre of London. G.E.C. subsidiaries are siting their main offices and staff in outer London and in the provinces. In today's circumstances there is need only for a key administrative headquarters in London.

Electrical Aspects of Road Research

ROAD casualty figures for 1960—7,000 killed and over 340,000 injured—were the highest ever recorded, according to the report of the Road Research Board published last week for the Department of Scientific and Industrial Research by H.M. Stationery Office, price 7s. This emphasises the importance of the work being carried out by the Road Research Laboratory, details of which are given in the Board's report.

Items of electrical interest include the development of two detectors which respond to the presence of a moving or stationary vehicle. One consists of two parallel loops of cable normally placed on or beneath the road surface, one being energised at 2 kc/s. There is a pick-up of this signal in the second loop, and the presence of metal near the loops causes a change in the mutual impedance between them and consequently a change in the signal collected. The detector is relatively insensitive to small changes in the loop size and consequently a fair degree of stability can be achieved. The size of the detector loop used with the commercially available equipment can be between 2ft by 2ft and 25ft by 5ft. The second detector utilises the Hall effect in a semiconductor. This detects small changes in the earth's magnetic field caused by the presence of ferromagnetic material in the vicinity. A prototype has indicated the presence of cars several feet away.

One application of these units is in the control of roundabouts by signals where vehicle-presence detectors could be used to indicate that traffic is approaching the point where it comes to a standstill. The signals could then automatically be set to "all red" to allow vehicles to disperse freely. The number of vehicles could be detected either by a large loop round the roundabout or by a number of Hall units around the central island.

In an attempt to increase road capacity, signals have been installed on the approaches to four roundabouts which tend to "lock" in the peak periods. An automatic extension to the "all-red" phase, based on the amount of congestion at the roundabout as measured by presence detectors, is being investigated.

Lighting Columns

In the section on safety, experiments relating to collisions between vehicles and lighting columns are described. (In 1958, some 90 fatalities occurred through accidents of this type.) Some columns yield more readily than others on impact, and thus reduce the severity of injuries to occupants of vehicles colliding with them. Their value in busy streets, however, is questionable because of the possibility of increased risk to pedestrians. The columns were tested by running 8 h.p. saloon cars into them at 22 m.p.h. They were of three common types for Group "A" lighting—a prestressed concrete column to B.S. 1308 : 1957; a tubular-steel column to B.S. 1840 : 1960; and a thin sheet-steel column to B.S. 1840 : 1960. The concrete column stopped the car in about 1/10th sec, the tubular-steel columns in about 1/5th sec, while the thin sheet-steel column bent and tore off underground, reducing the car's speed to about 8 m.p.h. The report states that for high-speed roads the thin sheet-steel type is to be preferred to the other two.

Investigations into the electrical heating of roads for preventing the formation of ice and frost and for melting snow have led to a number of developments. An experimental heating system has been built into the surface of the Hook road underpass on the Kingston By-pass, with a unit output of 9 W/sq ft and a total loading of 375 kW at 240 V. Another experimental heating system has been laid upon the deck of a prestressed concrete bridge at Basildon, Essex, having a unit output of 15 W/sq ft, and total loading of 40 kW at 240 V. The laboratory has prepared the design for the road heating system on the new Hammersmith flyover. The unit output here will range from 9 to 14 W/sq ft, depending on the position of the section in the structure. The total loading of the system will be 1·7 MW. The Laboratory has also assisted in the design and construction of the heating system at the Hangar Lane underpass on Western Avenue, the Hyde Park Corner underpass and on the approach ramps to the new Clyde tunnel.

The experimental road-heating installation at Slough was observed during the winter of 1959-60. The current was automatically controlled by the temperature of the road surface and the moisture upon it. During this period the running cost was approximately 1s 6d per sq yd. Two of the experimental heated sections on Harmondsworth Road, West Drayton, Middlesex, were used to study control systems. One section, with a unit output of 5 W/sq ft, was controlled by a simple thermostat in the road surface. The other section, with a unit output of 8 W/sq ft, was controlled by a wetness detector in addition to a thermostat, both in the road surface. The running cost of the section with a wetness detector for the period January to March, 1960, was approximately half that of the section having the simple thermostat.

Anti-static Rubber Flooring

WHERE electrical equipment is used in which the development of a fault could give rise to the risk of electric shock or fire (e.g. in hospital operating theatres), it is essential that rubber flooring, while being sufficiently conducting to disperse static charges, should also have sufficient resistance to limit to a safe value any leakage current from the electrical installation or apparatus through the floor to earth. Consequently rubber flooring for this field of application must have a resistance lying within a prescribed range with both the upper and lower limits clearly defined. Material with these electrical characteristics is designated "anti-static" and forms the subject of the recently published British Standard 3398.

In some places (e.g. buildings used for the manufacture of certain explosives) a predominant requirement is the provision of a comparatively low-resistance discharge path to earth. Further, where special measures are taken to eliminate the possibility of electric shock and fire by placing wiring and controls outside the zone of risk and where the use of portable electrical equipment and flexible connections is prohibited, an upper limit is placed on the maximum permitted electrical resistance of the flooring but there is no lower limit. Rubber flooring with these electrical characteristics is designated "electrically conducting" and is covered by a companion standard published in 1959—B.S. 3187.

The new standard covers the composition, workmanship, dimensions and physical properties of the flooring, and also lays down limits for electrical resistance both before and after laying. Advice is given on the electrical bonding of anti-static rubber flooring.

Copies may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 4s each.

Magnetohydrodynamic Generation

This article considers the possibility of generating electricity from the "conventional" fuels such as coal, oil and gas with an overall thermal efficiency of about 50 or 60 per cent. After reviewing the limitations of the steam cycle the author explains the "classical" M.H.D. cycle and passes on to some proposed modifications to the steady flow system. The present experimental situation and future possibilities are then discussed

By **M. W. THRING**, M.A., F.Inst.P., F.Inst.F., M.I.Chem.E.*

THE classical steam cycle, however much it is perfected, will never go over about 40 per cent efficiency, that is, of course, unless pass-out is used for some other purpose and this heat is credited to the cycle. The steam cycle is limited by the fact that water is, unfortunately, rather a bad thermodynamic fluid in the sense that the saturation pressure is much too high at rather low temperatures, and therefore it is impossible to make it absorb a lot of heat at the high temperatures which are readily obtainable by combustion even by working at extremely high pressures. Thus, it is essentially true that the steam cycle, even with so much reheat that it becomes practically a gas turbine cycle and with supercritical pressures, is bound to be limited to an overall thermal efficiency of the order of 40 per cent.

The difficulty with the steam cycle comes not only from the thermodynamic properties of water, but also from the fact that the method used to generate electricity essentially consists in the high-temperature thermodynamic fluid pushing against a metal blade, and then turning that force into rotation and then using that to cut lines of force in a magnetic field with a copper conductor. This is unfortunate, because it means that the temperature of the cycle is limited not only by the pressure side of it, but also by the mechanical properties of the metal blade, and the metal blade has to be extremely strong at the temperature at which it works, so this sets the metallurgists a difficult problem.

The "Classical" M.H.D. Cycle

The question that arises is how can one simplify the fuel/electricity system and if possible get round making the thermodynamic working fluid push on to a piston or a turbine blade. The first thing that occurs when the problem is formulated in this way is to simplify the generating system to a two-stroke internal combustion engine with a cylinder at each end and an aluminium piston and just push this backwards and forwards by explosions at alternate ends with appropriate inlet and exhaust valves. Then, with a magnetic field at right-angles to the aluminium piston, and a couple of carbon brushes in contact with the piston at right-angles again, we would have an a.c. generator which would be much simpler than the turbine system; but it is doubtful if anyone has ever built a machine like this. It would be a simple way of generating alternating current on a small scale, but of course it would still have the limitation of a metal piston, although the piston in a reciprocating internal combustion engine does not have to come into thermal equilibrium with the working fluid at the latter's highest combustion temperature because it is going through a temperature cycle, so that the temperature limitations in that kind of cycle are not so great as they would be in a steam turbine cycle.

The next step, therefore, is to consider how the piston can be eliminated altogether. Can electricity be generated without any metal parts which are worked on by the working fluid in a thermodynamic cycle ? That question leads one first to the electrostatic generator which is, of course, just the same thing really as a Van de Graaff silk belt generator, or the old-fashioned Wimshurst machine, except that it uses the gas to carry an electric charge against an electrostatic field. Combustion is carried out at high pressure, the products are expanded through a rocket nozzle at a very high velocity and then the kinetic energy is used; some kind of ionisation system discharges electrons into the gas and those electrons are carried against a negative electric field of a few million volts; the electrostatic force slows the gas down and a direct current is obtained from the electrodes.

When I did the calculations for such a system about ten years ago I concluded that it was not very promising for large-scale power generation. There are not enough degrees of freedom. Essentially, there must be very high voltages and space charge before the very large force can be exerted on the gas which is needed to slow it down, so I went away from the electrostatic generator concept, and then I came to the one which others have also thought about and which is now called the magnetohydrodynamic (M.H.D.) generator. I have always called it the direct production of electricity from fuels by the electromagnetic braking of hot gases, which is too long and elaborate a title.

The M.H.D. system consists essentially of a volume, and in that volume there is a very fast gas flow (velocity u cm/sec) in the x— direction, a strong magnetic field (H gauss) in the y— direction, and so the gas is cutting magnetic lines of force giving a voltage V in the z— direction where $\frac{V}{Z}=Hud\ 10^{-8}$ volts. If the gas is a reasonable conductor, electrodes on the two xy surfaces can be connected to an external load and power obtained, and that power will come essentially from the destruction of the velocity of the gases as they go through the system.

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* Professor of Fuel Technology and Chemical Engineering, University of Sheffield.

In the impulse system all the pressure drop of the gases is turned into kinetic energy before they enter the magnetic field, and then the velocity is reduced down to about a quarter of the initial velocity by the electromagnetic braking. The directed kinetic energy is being converted into d.c. electric power essentially under conditions of constant temperature and constant pressure and part of the resulting electric power goes into internal heating of the gases if they have a significant electric resistance compared with that of the load outside. The voltage V is given by the classical formula where H is the magnetic field, u is the velocity, and Z is the distance in the z— direction, and the sort of order of magnitude, for example, is that if H is 10,000 gauss and the velocity u is 4,000ft/sec, or $1{\cdot}2\times10^5$ cm/sec, then the d.c. voltage is about 12 V/cm across. The voltage produced is thus quite convenient. You can get a reasonable voltage with a high velocity, and a magnetic field which is not out of the question. The external power you can get out of this system per unit volume of the magnetic field is $\frac{W}{xyz}=\frac{H^2\ u^2\ 10^{-16}}{\rho_g(1+\alpha)}$ watts/cm^3 ρ_g=specific resistivity of gas (ohm-cm) α= the ratio of the external resistance of the circuit to the gas resistance taken over the whole of the electrode area. In the example, if α is taken as 19 and ρ_g as 1 ohm-cm, then $\frac{W}{zxy}=7$ W/cm^3. Since both H and u appear squared a large magnetic field and a large velocity are very helpful in giving a reasonable amount of power out of 1 m^3 of the magnetic field volume, and this, of course, is why this system is essentially more attractive than the electrostatic system, but here the whole problem lies in the specific resistance of the gases.

Unfortunately, a gas system which is a good thermodynamic working fluid is usually not a very good electrical conductor. The distance it takes to reduce the gas velocity to one-quarter of the initial velocity is critical to the whole system. A typical figure is that if the specific conductivity of the gas $\left(\frac{1}{\rho_g}\right)$ is 100 reciprocal ohms per metre, H=10,000 gauss and you use such a ratio α of the external to the internal resistance that 95 per cent of the power is released in the external field and 5 per cent in the internal field, then the calculated duct length is about 15 metres for a flow of 100 kg/sq m/sec. That is not a bad figure, so the process might be considered to be reasonable as a proposition simply under those sort of conditions.

The rest of the open cycle consists of an air compressor and a preheater using heat from the low-pressure hotter gases. After cooling the low-pressure combustion gases to atmospheric temperature they are recompressed back to atmospheric pressure and discharged. Both compressors are run from some of the electricity generated. In more recent cycles there is a waste heat boiler between the magnetic field and the air heater or between the air heater and the compressor which generates steam for additional power production. In an impulse system like this, the expansion pressure ratio is of the order of 10 : 1 and the adiabatic temperature drop on expansion of about half of the upstream absolute temperature. That, of course, is the essential difficulty of the process because, even though the combustion air is preheated in a heat exchanger, say, to the maximum possible in a metal recuperator (1,000°C), the combustion temperature is well over 2,000°C, but after adiabatic expansion in the convergent-divergent nozzle it comes down to something of the order of 1,200°C in the magnetic field.

The electrical conductivity of the gases depends very strongly on the temperature if thermal ionisation with a small proportion of alkali metal is being used. (Caesium is best for this purpose with an ionisation potential of 3·88 V, potassium is 4·33 V and sodium is considerably worse at 5·14 V.) The electrical conductivity is proportional to the concentration of free electrons and in the Saha equation for formation of free electrons by thermal ionisation, the log of the concentration is linearly dependent on a term which contains the ionisation potential divided by the absolute temperature, so the absolute temperature at which you get a certain number of free electrons in the gas is directly proportional to the ionisation potential; therefore caesium would be the best, but unfortunately it is too expensive to throw away into the atmosphere, so caesium is ruled out for an open cycle system. Potassium is not far inferior to caesium, and is cheap enough to throw away. Thus, it is usually proposed to put one per cent or so of potassium into the combustion gases and rely on that for the gas conductivity. But it is still necessary to have a temperature of the order of 2,500°K to get the required gas conductivities of the order of 100 mhos per metre, and therefore the temperature corresponding to the condition after adiabatic expansion is much too low. That is the basic problem of the " classical " cycle.

Modified Systems

The impulse system can be replaced by the reaction system, in which case the expansion is over a much smaller pressure ratio, giving a velocity of the order of Mach 1. The pressure and temperature are then dropped the remainder of the way down at constant velocity, the pressure change providing the power given out as electricity. That system has the disadvantage compared with the impulse system of a much lower velocity; but it has the advantage that the temperature is higher at the beginning of the passage through the magnetic field giving higher thermal ionisation.

Alternatively, one can try to replace thermal ionisation by artificial ionisation, such as from a high-frequency discharge. This is not likely to be successful in an open cycle system because the tri-atomic molecules CO_2 and H_2O (which occur in the combustion products from any fuel) are extremely good at mopping up free electrons, and therefore any form of artificial ionisation will not survive, even for the millisecond or so that the gases go through the magnetic field. While it only takes one per cent of the power produced to ionise the gases once, they may have to be ionised 100 times. Other methods that have been proposed are all sorts of closed cycle systems where some suitable gas, say argon loaded with potassium, is cycled around, but a closed cycle means heating the cycle gases when they are at high pressure through a wall from ordinary combustion products on the other side of the wall, to the T_1 temperature of the cycle. The present state of the art of heat exchanger design is such that we cannot design a continuous recuperator where heat is passed through a wall from a low-pressure hotter gas to a high-pressure colder gas to work above a maximum temperature of 1,000°C, and therefore we could make a reasonable preheater for combustion air, but we could not possibly make a reasonable heater for heating a closed cycle system from combustion products.

All sorts of different geometries have been proposed for the M.H.D. generator. The radial magnetic field, with the gas flowing down an annulus, gives a circumferential voltage and if the radial magnetic field is alternating, the electrons swing alternately one way and then the other way round. This can be treated as the primary of the transformer, a secondary put round it and the power taken off without having the electrodes which are an awkward part of the d.c. system, and also without having a convertor from d.c. to a.c. It has also been proposed not to have an external magnetic field at all, but simply to have pulsations in the conductivity of the gas and then a parametric amplifier to take the power.

Present Experimental Situation

That is very broadly the situation without going into details. A number of organisations are working on this, and Way and Hundstad of Westinghouse gave a paper at the Pasadena Conference on their pilot generator burning oil with concentrated O_2 and weak potassium seeding in a little generator $1\frac{1}{2}$in by 4in by 6in long. With a gas velocity of 820 m/sec they got 80 V open circuit, 70 V closed, and a gas conductivity of the order of 15-20 mho/m and with a magnetic field of 14,000 gauss they got 6·4 kW out of it for a period of two to four minutes. By burning with highly oxygen enriched air they got a temperature in the combustion chamber of the order of 2,800°K, and therefore after expansion the temperature was still high enough to give them reasonable thermal ionisation with the potassium.

AVCO have used a plasma jet of argon or helium with potassium at a temperature of 2,800°K at a high velocity ($M=0{\cdot}7$) for 10 sec and have obtained 430 α at 27 V. Their system verifies the physics of the system, but as the heat was electric the more difficult problem of combustion with air remains open. They have also calculated a cycle for pulverised coal combustion based on the assumption that the combustion air can be preheated to 2,000°C. Industrial furnace designers have long been trying to invent air heaters for higher and higher temperatures, and there are air heaters running up to something of this order, but they are regenerative or reversing air heaters which need valves for the heated and cooled gases, and heat a pebble bed. It is difficult to see how one could generate power with a heat exchanger in which gases of the order of 2,000°C had to be reversed by means of valves every two or three minutes.

At the University of Sheffield Dr. Switsur worked on the design of a closed cycle system, and measured the decay of ionisation in argon, with the idea of using a heat exchanger to heat the argon, and we worked on the design of a continuous rotary regenerative heat exchanger for the very high temperatures that would be involved. In England, also, preliminary experiments have been done on the mercury vapour closed cycle system with radio frequency ionisation and as in the case of the AVCO experiments, what they have really shown is that the classical electrodynamic equations seem to be obeyed perfectly well in this type of system.

Dr. Pain in the Physics Department at Imperial College has put a shock wave driven by hydrogen and oxygen into low-pressure argon, through a magnetic field. He has measured a power output of something of the order of a megawatt for a microsecond and he has actually deflected part of the shock wave backwards in space, so that he has demonstrated the effectiveness of the braking action of the magnetic field.

Future Possibilities

The M.H.D. generator will certainly be successful, and will ultimately be a practicable method of power generation from combustion of coal and oil and natural gas, and from nuclear fission and fusion, but in order to do that, the thermodynamics of the simple system referred to in this article will have to be improved. The simple system has the essential difficulty that the higher the velocity and the larger the adiabatic expansion temperature drop $T_1 \rightarrow T_2$ which is necessary to give a good thermodynamic cycle (a good Carnot efficiency $1-\frac{T_2}{T_1}$) the more difficulties arise because the gases are too cold when they are in the magnetic field to have enough thermal ionisation. There does not appear to be a satisfactory way out of this in the simple cycle so that it is essential to improve the thermodynamic cycle.

The first way of doing this is to say the whole of this system is bedevilled by the fact that the same gas is being used as the working fluid and as the electrical conductor. A way of separating physically in space the electrical conductor and the working fluid is needed. Suppose the potassium is not inserted into the main combustion gases which leave the combustion chamber somewhat over 2,000°C and expand down to 1,200°C in the nozzle, but into a grid of pipes across the tail end of the combustion chamber just before the gases begin to accelerate to high velocities in the convergent throat of the nozzle. These pipes are alternately connected to supplies of pure oxygen and fuel. Now, it is possible to arrange a pulse feeding system for these two materials, the fuel and the oxygen, in such a way that for 10 per cent of the total time they are inserted very fast, in very short cycles in time, and in the remaining 90 per cent of the time nothing enters through those tubes.

During the 10 per cent part of the time cycle a very rapid mass flow of gas is inserted which in effect stops the main flow and puts a short stream of different gas of composition which has been chosen to burn with pure oxygen and carry the potassium seeding, so as to have potentially a very much higher temperature and give a reasonable electrical conductivity. Moreover, the combustion of this subsidiary flow striation can be delayed so that it is actually releasing heat all the way through the expansion process in the nozzle and even in the magnetic field (to give direct flame ionisation). The rest of the gas can now work through the most appropriate thermodynamic cycle, expanding down to 1,200°C, or even lower. Thus, there are thin conducting layers passing through the magnetic field stretching right from one electrode to the other. The diffusion of heat and matter between the hot conducting layer and the driving fluid during the millisecond that it goes through the magnetic field will not be very great, because the thickness of these layers is of the order of inches and the intermediate layer, of course, is much greater, but there are still three or four of these conducting layers in the magnetic field at a given time. Thus, it is as if there were a skin which is being strongly retarded by the magnetic forces which is conducting the current right across, and the thermodynamic working fluid presses on that skin and is forced to slow up because the skin is slowed up by the force.

Another proposal for changing the thermodynamics of the system arises from the work of Reynst who developed a pulsating combustion system with aerodynamic valves and showed that he could obtain combustion effectively at constant volume, the resulting pressure rise being converted directly into directed flow velocity. This eliminates much of the need for an electrically-driven compressor and can readily be combined with the striation system by introducing the conducting layers at the beginning of each pulse.

A third way of improving the thermodynamic cycle is related to the pair of internal combustion engine cylinders pushing an aluminium piston backwards and forwards as they explode at each end, mentioned earlier. The proposed system, in effect, is the same as that, only it uses a conducting gas pulse in place of a solid piston. Here a large cylinder which, for example, is 1 metre in diameter and 40 metres long has an inlet and outlet valve system at each end. It can be described as if it were started like a shock tube with a diaphragm near one end, and low-pressure gases on the long side and at slightly above atmospheric pressure the explosive combustible mixture on the short side. If the latter is fired and the diaphragm ruptured, the shock wave runs along through a magnetic field in the middle, giving a temperature in the shock front which is very much higher than the combustion temperature if the compression ratio is high. If some potassium is in the shock front there will be a thin layer of gas of high conductivity and the magnetic field will therefore convert a substantial fraction of the kinetic energy of the gases when they are moving at high speed in the middle to electricity. The advantage of this system is that for high efficiency it is only necessary to extract, say, 10 per cent of the kinetic energy of the gases in the middle, not the 94 per cent required in the simple "classical" thermodynamic cycle, because the remainder of the kinetic energy of the gases can then be used to compress the next explosive mixture at the other end as they retard. Thus, an explosion system with parallel walls can give the appropriate velocities and gas conductivities for the necessary power output in the form of alternating current pulses with potentially a very high overall thermal efficiency.

Thus, it may be concluded that the future of M.H.D. generation lies in using a thermodynamic cycle different from the "classical" one, perhaps along one of these lines, perhaps along some other line. It is necessary to apply the same kind of inventive ingenuity that the steam engineers have applied to the turbine and dynamo system over the last hundred years to the magnetohydrodynamic generator before it will catch up with the existing systems.

FLOOR HEATING REPORTS

TWO reports dealing with various aspects of electric floor-heating systems have recently been published by the British Electrical and Allied Industries Research Association. The first, Ref. Y/T26: "Performance of Electric Floor-Heating Installations in Large and Small Buildings," by M. V. Griffith and S. W. Menzies (price 28s), deals with observations made on practical off-peak electric floor-heating installations at intervals over the period 1951-1956. Both long-term and short-term tests are included and the buildings studied varied from single-storey, poorly-insulated halls to a modern school and a well-insulated, multi-storey office block. Present consideration is restricted to estimates of installed electrical loading and annual consumption, mean daily inside temperatures maintained, the rates of cooling during periods when the supply is switched off, and the effect of weather conditions on consumption and inside air temperature (obtained by statistical methods).

It is concluded that annual energy requirements to maintain specified internal conditions are sometimes over-estimated and that this is at least partly due to the use of incorrectly high rates of ventilation and to allowances for solar and metabolic gain which are too low. Because of this inaccuracy in estimating, off-peak floor-heating systems are providing satisfactory temperature conditions even when apparently of inadequate capacity. The practice of electric floor heating is, however, progressing rapidly and improved methods of estimating are already being used for installations later than those included in the present study. Any comparison between the results given in the report and the performance of later installations, e.g., the number of hours of operation per year per kilowatt of design heat loss, can easily be made by taking into account the values of this design heat loss obtained by the two methods.

Further research is necessary to determine more accurately the correct rates of ventilation and effects of absorbed solar energy to be used in estimates of the consumption and response of floor-heating systems.

Embedded and Ducted Systems Compared

The investigation described in Report Ref. Y/T27: "The Comparative Performance of Directly-Embedded and Ducted Electric Floor-Heating Systems. Further Laboratory Tests on Wider Spacings," by D. H. Gardner (price 10s 6d), is part of a study of the comparative thermal performance of the two systems; the present report covers wider spacings and extreme weather conditions.

It is concluded that the alternative methods of installation are equal in thermal performance both for steady state and for transient conditions, i.e., that for the same rate of watts input, in similar external conditions, directly-embedded cables and cables in ducts will give the same floor surface temperature and air temperature and that these temperatures will be reached after the same number of hours of heating time. The study was restricted to metal-sheathed mineral-insulated cables for both methods of installation.

Turbine Research

A NEW mechanical engineering research laboratory was recently commissioned by C. A. Parsons & Co., Ltd., at their Heaton Works, Newcastle-upon-Tyne (see p. 1116, *Electrical Review,* 23rd June). It is equipped to provide research and experimental facilities suited to the rapidly changing requirements of the "power" industry and is additional to the extensive services already existing and the Parsons nuclear research centre, which was established just over two years ago.

In recent years, two important factors made it necessary to reconsider the research facilities available to cover the company's interests in turbines and axial and centrifugal compressors. The first was the immediate impact of nuclear energy and its expected growth; the second was the extraordinarily rapid increase in the size of individual machines combined with higher steam pressures and temperatures.

As far back as 1949, the company took steps to provide testing facilities which would permit of exploring the behaviour of axial and centrifugal compressors specifically designed for nuclear work, and operating as far as possible under working conditions. Plant for this purpose is large, costly and space consuming but in 1952 a closed-circuit compressor test rig was completed, the machines under test being driven by a 3,000 h.p. steam turbine. In a relatively short time, however, circulators grew in size and duty and it became clear that a much larger test facility was necessary.

At the same time, additional experimental equipment was needed to test and develop turbine blading for large steam turbines which, in the course of a few years, had developed from units of 60 MW to machines of over 500 MW. It was against this background that the new mechanical research laboratory was conceived.

A large modern building, 250ft long by 65ft wide, was modified to suit the requirements of the laboratory. It houses two 5 MW turbo-generators, which give a variable frequency supply to the experimental equipment; a 10,000 h.p. closed circuit compressor and circulator test rig; a 180 h.p. model circulator test rig; a variable density air turbine, and an experimental low pressure steam turbine. Other items include a low speed wind tunnel.

Compressor Testing

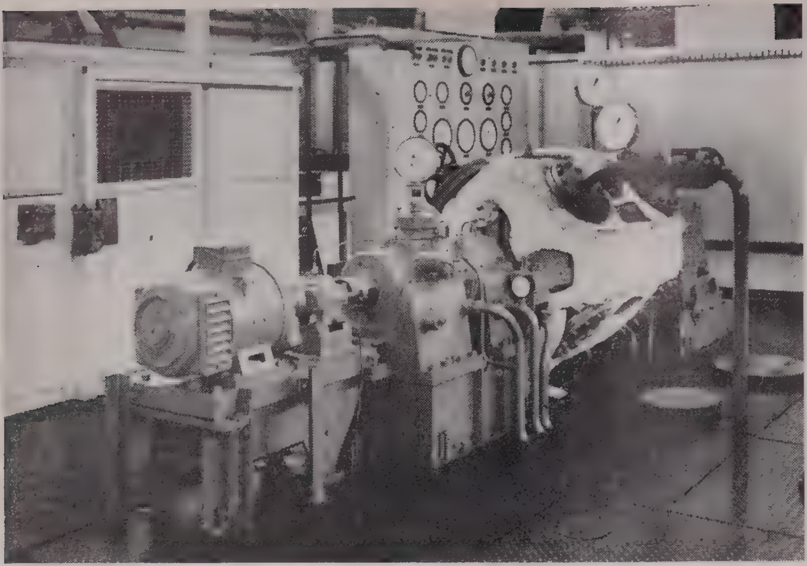
The 10,000 h.p. compressor and circulator test rig is of the closed circuit type employing 6ft 6in diameter ductwork 1¼in thick with a maximum working pressure and temperature of 300 p.s.i. and 300°C, respectively. Circulators of up to 2,000 cu ft/sec capacity can be tested at these gas conditions and provision has also been made for testing conventional compressors with a maximum temperature rise of 230°C. Circulators up to approximately 2,500 cu ft/sec capacity can be tested at lower pressure levels so as to keep within the output of the driving motors.

The compressors or circulators are driven by two-pole squirrel-cage motors with external bearings and cooling arrangements. Dual windings are provided with six ends brought out so that with the various series-parallel, star-delta arrangements, the machines can be run at full load if necessary on 11 kV, 5·5 kV or 3·3 kV, at a frequency of 50 c/s. A 1,500 h.p. slip-ring induction motor is used to run up the line to speed with the circuit at atmospheric pressure.

This test rig is uniquely suited to full scale testing of large circulators and has therefore been made available to other manufacturers of large compressors for testing under industrial conditions.

The 180 h.p. model circulator test rig is used for testing blading for gas circulators and alternator fans. Generally the rig will only be used on open circuit although the

General view of the new mechanical engineering research laboratory, showing the motor drive for the circulator and compressor test rig in the foreground. The two 5 MW turbo-generators which supply power at variable frequency to the laboratory can be seen on the platform in the background



Variable density air turbine for more detailed research on turbine blading than is possible when using steam

casing can withstand two atmospheres, if necessary, for closed circuit work. The fabricated outer casing is in three main parts. The middle portion, which is in one piece, carries an internal tubular member supported on eight radial ribs. This is bored out to form a tunnel into which are inserted the blade rings and distance pieces comprising the stator. The stator blades are set to the desired angle in the blade rings before being slid into the tunnel. The rotor, which also has adjustable blades, is split to take the blade roots, each blade being held in its desired setting by a set screw. The rotor is mounted on a shaft carried in plain bearings, the bearing housing being welded to the ends of a tube which extends to connect up with the thrust block. A flexible drive of the quill type is used between the driving motor and the rotor shaft.

The outer shell of the motor is held in ball bearing trunnions while the main armature bearings are of the plain white metal type. The circulator shaft bearing-housing and the motor casing are coupled so that a restraining torque applied through an arm on the motor casing gives a measure of the net power needed to drive the circulator rotor. This arrangement automatically deducts the power absorbed by bearing and thrust friction.

Variable Density Air Turbine

To explore blading phenomena in more detail than is possible when using steam, a variable density air turbine is operating in the new laboratory. The air for this turbine is supplied from a motor-driven axial flow compressor working in a closed circuit with the turbine and a cooler to preserve the required temperature at the inlet to the turbine. By varying the density in the circuit, tests can be made over a range of Reynolds numbers as well as over a range of velocity ratios. Great attention has been given to pressure and yaw measurement both up-stream and down-stream from the moving and stationary blading.

Experimental L.p. Steam Turbine

The experimental steam turbine installed in the new laboratory has been primarily designed to investigate blading and other problems in low pressure turbines. The plant installed is a scale model l.p. steam turbine which operates at normal vacua and well within the capacity of the present boiler plant. The inlet is modelled to provide uniform flow conditions and the exhaust casing is larger than scale size to provide room for alternative shapes of exhaust.

Aerodynamic Tests

It is desirable to keep the pressure drop between the last blade row and the exhaust flange of a turbine to a minimum to reduce the loss of available energy. This is of particular importance in machines of large output and so it is usual to prepare a scale model of the proposed exhaust end suitable for air or steam testing. The high speed air tests are now carried out on improved aerodynamic rings in the new laboratory. The equipment includes two blowers connected in series each driven by a slip-ring motor. Each blower provides air at 68in total water gauge when running at 2,900 r.p.m. The air is fed into an 18in diameter duct which in turn can supply any one of four different metering lengths, and the mass flow is controlled by a butterfly valve situated within the inlet ducting.

Nuclear Electronic Symposium

THE Measurement and Control Section of the Institution of Electrical Engineers is arranging a symposium on nuclear electronics to take place on 30th November and 1st December next. It will be held at the Institution's headquarters at Savoy Place, London, W.C.2, and is intended to follow up the conference on the same subject held by the International Atomic Energy Agency in Belgrade in May of this year.

The symposium will consist of three sessions, dealing respectively with "Radiation Detectors," "Electronic Circuits and Techniques" and "Radiation Monitors and Instruments." At each session, a report on the subject of the relevant papers presented at Belgrade will be given, after which other speakers will either deal in more detail with subjects which they themselves presented there, or give their own appraisal of the impact of the Belgrade conference on current researches in this country. At the end of each session there will be an opportunity for the discussion of all the material presented.

Television Conference

AN international television conference is being organised by the Electronics and Communications Section of the Institution of Electrical Engineers, in association with the Television Society. It will be held at the Institution from 31st May to 7th June, 1962, inclusive.

The period chosen for the conference will overlap the last three days of the International Instruments, Electronics and Automation Exhibition which is to be held at Olympia, London. A brochure giving details of the programme and a registration form for the conference will be available early next year.

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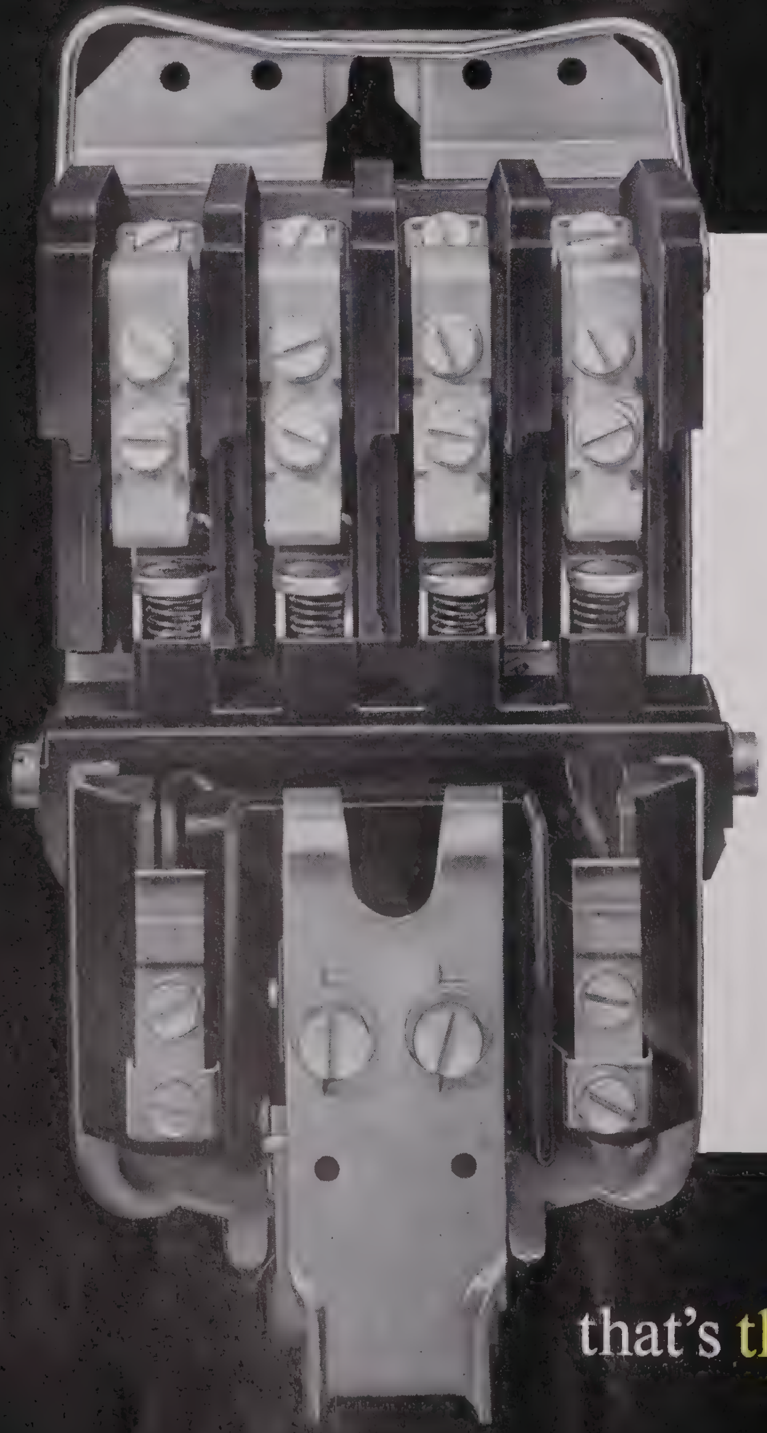

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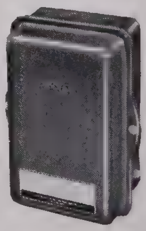

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LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

"Undergrounding" the Supergrid

I ENTIRELY agree with the comments of "C.B." in your 25th August issue regarding the effect on system stability of including many miles of insulated cables, giving rise to leading power factors.

I did not refer to this consideration in my letter dealing with the cost of installation of cables because, in spite of the title of Mr. Aitken's article, there is no prospect that the undergrounding of sections of 275 kV and 400 kV line sufficient to affect the stability of the "supergrid" would ever be economic or desirable.

My concern is that, in areas where, apart from the great difference in cost, underground cables might be considered, the cost comparison should be as factual as possible and should be based on the most favourable route and method of installation of the underground alternative.

I have spent most of my working life in installing overhead lines and I would express the personal view, in commenting on Mr. A. Keller's letter in the same issue, that the designs of the grid towers, and of most other transmission towers, call for little alteration at the hands of "artists" to improve their appearance. If a design is technically sound and economic, it usually looks about right. The great thing about transmission lines compared with most other causes of disfigurement, such as quarries and industrial development, is that they are a temporary addition to, and not a permanent alteration of, the landscape and one which can be seen to be doing its job well.

Wylde Green, Sutton Coldfield. J. R. Harding.

Surplus Power

I AM writing to you in the hope that you, or perhaps some of your readers, may be able to assist me in a small problem which has been exercising my mind for some little time.

I have a surplus of electrical energy of 250-300 kW 24 hours per day, seven days per week. This power is produced from a hydro-electric station and I am anxious to make use of it to the best advantage. As it is in a country area, it is impracticable to build round it an industry which would require a great deal of labour. Furthermore, due to its remoteness, it would not be possible to process any large quantity of material, as the cost of carriage would make it uneconomic.

I am wondering if there are any processes such as anodising, electro-plating, etc., which might answer the problem. Perhaps even the refining of precious metals by some electrical process might be possible. In the event of going ahead with some scheme of utilising the power I should, of course, be looking for someone to run it.

Any assistance which you, or your readers, could give me would be greatly appreciated.

Haverthwaite, nr. Ulverston. Dennis White.

ATLAS COMPUTER FOR HARWELL

A FERRANTI Atlas electronic digital computer has been ordered for the National Institute for Research in Nuclear Science for their Rutherford High Energy Laboratory, Harwell. This computer has been developed in co-operation with Professor Tom Kilburn at the University of Manchester, where the prototype is now being assembled. It is claimed that the computer will be the most powerful in the world and will be 100 times faster than the Ferranti Mercury computer. The Atlas will be able to perform about one million simple additions or 300,000 multiplications per second. The machine has a word length of 48 binary digits and these can be used for fixed-point numbers, for floating-point numbers, for alpha-numerical data, or for programme instructions.

The price of an Atlas installation is in excess of £1½ million. The total cost of the computer and the necessary buildings for the N.I.R.N.S. will be about £3½ million and it should be ready for use in early 1964. The Harwell machine will be used by the universities, the United Kingdom Atomic Energy Authority, Government Departments and the N.I.R.N.S. itself. The biggest demands on Atlas are likely to be made by the Culham Laboratory of the U.K.A.E.A. and the National Institute itself. Another main user may be the Meteorological Office.

One of the main design features of the Atlas is the method of achieving rapid transfers of information into and out of the high-speed store. The main store consists of a high-speed magnetic core store backed by four magnetic drums of slower access but much larger capacity. This compromise, which is also used in many other computers, overcomes the economic difficulty of providing a high-speed store of sufficiently large capacity. Unfortunately, large blocks of information continually have to be transferred from the drum store to the core store and back again. In most computers these transfers have to be performed by instructions written into the programme. In the Atlas, storage transfer is taken over by a built-in automatic system. As a result, the programmer does not have to think about two distinct stores but simply works as if there were just one high-speed single-level store of large capacity. This automatic method of allocating storage space is particularly valuable when the Atlas is performing several programmes simultaneously by time-sharing technique.

Another feature of the main store which contributes to the high computing speed is a means by which the instructions can be "overlapped" in time to some extent. This is made possible by providing several distinct paths of access to different parts of the high-speed core store; in fact, as many as three consecutive instructions may be in different stages of execution at the same time.

The automatic system for allocating storage space is actually operated by special electronic circuitry under the control of a short, fixed sequence of instructions. This short routine is held permanently in a special store, of unique design, along with other fixed routines (about 250 altogether) frequently used for arithmetic and internal control operations—in fact, all the operations normally found in the sub-routine library of any well-equipped computer.

This special "fixed store," as it is called, is one of the original features of the Atlas design. The routines are put into it initially by inserting small rods of magnetic material into a wire mesh sensing system, which links with the rods magnetically and produces digit pulse patterns corresponding to the spatial patterns of the rods. (Strictly, this store is a semi-permanent one, because the routines can be changed manually if required.)

In common with all modern computers, the electronic circuitry of the Atlas is constructed from transistors and other semiconductor components which are mounted on plug-in packages for ease of maintenance. Comprehensive test routines, held in the fixed store, are regularly brought into operation on a time-sharing basis during suitable intervals caused by transfer processes in the main programmes.

T.U.C. AT PORTSMOUTH

THE ninety-third Trades Union Congress opens at the Guildhall, Portsmouth, next Monday. In one brief paragraph, the General Council's report refers to the investigation by the Finance and General Purposes Committee into the affairs of the Electrical Trades Union. An account of the investigation will be given to Congress in the form of a supplementary report. The General Council has accepted the recommendation of the Committee that the E.T.U. should be expelled from Congress, and this is expected to be put to the delegates on Monday.

It is significant that the one resolution on the economic situation should come from the Inland Revenue Staff Federation. It is, however, not so much concerned with the crisis in the national economy as with the measures the Government has taken to meet it. It refers to "the shift in emphasis from direct taxation, which takes into account ability to pay and is therefore more equitable from a social point of view, to indirect taxation, which is levied on spending." Stating that the trade union movement is just as concerned as the Chancellor over the health of the national economy, the motion then bluntly declares "that appeals for wage restraint will only receive a realistic response when it is apparent that there is to be equality of sacrifice by all sections of the community."

The Inland Revenue Staff Federation had framed its motion before the Chancellor of the Exchequer had announced his "wage pause." An amendment from the Tobacco Workers' Union refers to the Chancellor's appeal for wage restraint and calls upon the General Council to give full support to affiliated unions in their efforts to obtain adequate wage increases to enable their members to improve their standard of living.

The Shop, Distributive and Allied Workers' Union "directs attention to the deplorable indifference on the part of many employers to the national interest, evident by their failure to encourage their young workers to undertake technical education and, in particular, to grant the necessary facilities, including day release," and calls upon the Government to make day release obligatory.

Of the four motions on the European Common Market, two oppose Britain's entry and the other two ask for guarantees and assurances before going in. The National Society of Operative Printers and Assistants demands continuity of traditional collective bargaining, protection for British agriculture, continuation of Commonwealth preferences, and no sacrifice of British sovereignty and independence. The motion of the Boilermakers' Society and an amendment by the Constructional Engineering Union seek protection for the workers by safeguarding the rights of affiliated unions, and by the initiation of discussions with the trade unions of the Common Market, E.F.T.A. and the Commonwealth countries.

There are only two motions on nationalisation; one, from the Electrical Trades Union, demands the nationalisation of electrical plant and equipment manufacture, heavy engineering, "and those other sectors of British industry which Congress has in the past agreed should be nationalised."

Just as long and pedestrian as always, this year's report of the General Council contains very little to arouse the enthusiasm of the staunch trade unionist.

It would appear that the General Council has now brought to an inconclusive end its inquiry into unofficial strikes and workshop representation, started in 1938 and reported to Congress last year.

The report returns to the old theme of the need for an effective and co-ordinated fuel and power policy. In urging this policy on the Government, the General Council can report little success. At a meeting with the Minister of Power last year, the representatives of the General Council were told that the Minister could see nothing inherently undesirable in competition between the fuel and power industries, and that arrangements for securing co-ordination and co-operation were sufficient without a Fuel and Power Advisory Council.

E.T.U. Statement

Following a meeting of the E.T.U. Executive Council on Monday, Mr. Frank Foulkes (general president) read a statement on a resolution passed by the Council. This expressed profound regret at the expulsion recommendation and went on to say: "We are convinced that such a decision by Congress would not be in the best interests of the movement or this union and would provide an opportunity to opponents to weaken the whole trade union movement." The Executive Council were convinced that it was in the best interests of the movement that their organisation should remain within the Congress with the same obligations as other affiliated organisations while at the same time conforming to the rules and policy of the union. The General Council could be assured that the Executive Council would take all necessary steps to ensure that there was no interference in the affairs of the union by any outside body.

Mr. Foulkes said that there was no question of the union taking legal action against the T.U.C. on the ground that the T.U.C. had exceeded their powers in the ultimatum of 26th July or in the recommendation of expulsion.

VIEWS on the NEWS

By "REFLECTOR"

WHETHER a national gas grid is feasible is a matter not really settled in the recent report on the gas industry by the Select Committee on Nationalised Industries. Whether it is necessary is also questionable. A correspondent to the *Daily Telegraph,* Mr. H. Lidgey, is quite sure that it is not. He is a bit hard on the gas industry, implying that almost all its distribution mains should be superannuated. He also points out that for lighting and heating electricity can do all that gas can do and is essential in factories and homes for mechanical power, radio and television. He suggests that

> " the country would be much better advised to call a halt to further heavy expenditure on an industry which has served its purpose and should now be allowed to fade into history."

I would not like to subscribe to this point of view. The gas industry still has its niche, albeit a rather narrowed one.

* * *

I don't want to overdo comments on gas, but reference should be made to the repainting of the Wandsworth gasholder—a prominent South-West London landmark. This has been done in graduated blues, starting from dark and finishing at the top with a very light tint, making it look somewhat like a cylindrical Alp. Such treatment is really more necessary for gasholders than for " pylons " which come in for more public criticism than they really (comparatively) deserve.

* * *

"You can't blame me for the communists, mate—I didn't even vote."
Reproduced by permission of "Punch"

Mr. Bernard Miles, the director of the Mermaid Theatre, London, has given the job of stand-by electrician to Mr. F. Haxell, the former general secretary of the Electrical Trades Union. As the theatre is an " open shop " Mr. Haxell will be able to retain his membership of the E.T.U. and not be forced to transfer to the National Association of Theatrical and Kine Employees. The *Daily Mail* says that in the telegram making Mr. Haxell the offer Mr. Miles averred:—

> " Mermaid strongly democratic. All party, inter-denominational, multi-lingual. An organisation deploring victimisation of all kinds."

Which I suppose were appropriate sentiments in the circumstances.

* * *

A Manchester man's electricity supply had been cut off after his failure to pay a £75 bill (for what period was not reported); he reconnected the supply and used 1,733 kWh before it was discovered and he was brought before a magistrates' court. As he had previous convictions for the same kind of offence, he was sent to prison for three months. In sentencing him, the magistrate made the following cryptic remark:—

> " I have the utmost sympathy for people in an all-electric house but you had been warned for this on previous occasions."

* * *

Much has been done, for a very long time, by the City and Guilds of London Institute in the cause of technical education. I have come across a " preview " of the 1881-1882 programme of the Institute in the *Electrical Review* of 1st September, 1881. In the course of this it was said that:—

> " A special laboratory class for students attending this course will be held on Wednesday evenings, from 6.30 to 8.30, in which students will be taught to make exact measurements of electric currents, electromotive forces and resistances, and to practically use absolute instruments when very strong electric currents have to be measured. They will then practise making measurements of the illuminating power of electric lights produced by various strengths of electric current, generated by dynamo-electric machines driven by a six horse-power gas engine in the laboratory fitted with suitable gearing to enable the dynamo-machines to be run at any desired speed; and they will compare the relative illuminating powers with the energy absorbed in the arc in each case, so as to determine experimentally the relative efficiencies of different forms of electric lighting . . . Experiments will likewise be made regarding the practical efficiency of electric transmission of power under various conditions."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. L. J. Davies has been appointed to the newly created position of director of research, Associated Electrical Industries, Ltd. Mr. Davies, who has been director of research of A.E.I. (Rugby), Ltd., for the past 16 years, will be responsible for the direct supervision of the four A.E.I. research establishments at Aldermaston, Harlow, Manchester and Rugby. The appointment, A.E.I. say, is aimed at ensuring a coherent research effort by the company and making the most effective use of the resources and scientific ability in its various laboratories.

Mr. L. J. Davies

Mr. Davies reports to the A.E.I. board through Sir Cecil Dannatt, the vice-chairman, and now becomes a non-executive director of A.E.I. (Rugby), Ltd. **Dr. J. E. Stanworth** has succeeded Mr. Davies as director of research, A.E.I. (Rugby), Ltd. The other directors of A.E.I. research laboratories are: Dr. T. E. Allibone, Aldermaston; Dr. J. M. Dodds, Manchester; and Dr. M. E. Haine, Harlow.

The Eastern Electricity Board has appointed **Mr. G. W. Rufford**, A.M.I.E.E., as engineer of the North Essex District in the place of **Mr. I. A. Lauder,** who is retiring shortly. Mr. Rufford is at present 2nd assistant engineer in the technical and substation construction department of the Ilkeston and North Derbyshire Sub-Area, East Midlands Electricity Board.

Mr. G. W. Rufford

Mr. Thomas Coates, M.Eng., M.I.E.E., M.I.Mech.E., has been appointed managing director of J. Gerrard & Sons, Ltd., builders and civil engineering contractors, of Swinton, Lancs., with effect from 4th December next. In the meantime he will act as general manager. Mr. Coates was deputy chairman of the North Western Electricity Board until last January when he took up the position of general manager of the Egg Marketing Board.

Mr. R. T. Gladwell has been appointed industry group manager for Aircraft - Marine Products (Great Britain), Ltd., in which position he is responsible for the control of the specialised industry groups within the sales organisation. Mr. Gladwell joined A.M.P. in 1956 and was previously with the English Electric Aviation Co., Ltd.

The G.E.C. Installation Equipment Group, which is introducing a new distribution system to give improved service to wholesalers and contractors (see page 339), announces that **Mr. E. G. Taylor,** B.Sc. (Eng.), M.I.E.E., F.I.E.S., has been assigned to special "wholesale liaison" duties in the north of England. Although he will be attached to Group headquarters, Mr. Taylor will operate from Manchester. A graduate of Birmingham University, Mr. Taylor began his career with G.E.C. as an apprentice at Witton Engineering Works and subsequently held appointments at Liverpool, Swansea and Manchester. In 1958 he was appointed manager of the north-west area.

Mr. E. G. Taylor

In 1941-42 Mr. Taylor was chairman of the Mersey and North Wales Centre of the Institution of Electrical Engineers, and he served on the Council of the Institution from 1941 to 1944. He was a member of the Anglo-American Materials Handling Productivity Team in 1949.

Mr. A. E. Watts, manager of the Birmingham branch of Allen West & Co., Ltd., since 1941, retired on 31st August. He served his apprenticeship with the Igranic Electric Co. and gained further experience with Crompton & Co., the Electrical Apparatus Co., and the Metropolitan-Vickers Electrical Co. before joining the Allen West organisation in 1923 as an estimator. From 1936 until his appointment to Birmingham he was a sales engineer at the London office. He is succeeded by **Mr. T. J. Ollis,** who was for more than 20 years at the Allen West Manchester office before being appointed deputy to Mr. Watts at Birmingham in 1958.

Mr. J. K. Dent, M.I.E.E., who, as already announced, has been appointed principal assistant engineer in the Commercial Department at C.E.G.B. headquarters, was educated at Newton Abbot Grammar School and the Rugby College of Technology. After an engineering apprenticeship with the British Thomson-Houston Co., Ltd., and a period developing new production plant for magnetrons, he entered the electricity supply industry in 1945 and since 1956 had been senior assistant engineer (distribution design) in the Sheffield Sub-Area of the Yorkshire Electricity Board. Until leaving Sheffield for London, he was hon. secretary of the Sheffield Sub-Centre of the Institution of Electrical Engineers.

Mr. J. K. Dent

Ultra Electronics, Ltd., have appointed **Dr. F. W. Stoneman,** M.B.E., executive director, sales and engineering, **Mr. Allan Sadler** chief engineer and **Mr. D. S. MacIntyre,** general sales manager.

Mr. R. Turner, A.M.I.E.E., has been appointed sub-area commercial officer, York Sub-Area, North Eastern Electricity Board. He is at present senior assistant engineer (commercial) in the No. 6 (Hull) Sub-Area of the Yorkshire Electricity Board and previously held appointments with the Cardiff R.D.C. Electricity Department, the South Wales Electricity Board and

Mr. R. Turner

the North Western Electricity Board. From 1943 to 1946 he served as an electrical lieutenant in the R.N.V.R.

Mr. C. Wilkins, A.M.I.E.E., who has held the position of sub-area commercial officer at York since vesting day, is retiring on 10th September. From 1924 to 1948 he was with the North Eastern Electric Supply Co., Ltd.

Mr. J. V. Daniel, managing director of Crompton Parkinson, Ltd., has resigned from the board of Atomic Power Constructions, Ltd. This resignation follows upon the withdrawal of Crompton Parkinson, Ltd., from the Atomic Power Constructions, Ltd., consortium.

Mr. J. A. Dunbar, A.M.I.E.E., has been appointed manager for Scotland for the Aberdare group of companies. He will control sales promotion for the group in Scotland, and will also operate the Scottish factory of South Wales Switchgear, Ltd., at Glasgow. Mr. Dunbar was formerly senior sales engineer of the Instrumentation Division of Associated Electrical Industries, Ltd., at Trafford Park, and previously superintendent of the A.E.I. London Meter Department.

Mr. J. A. Dunbar

Mr. L. G. Clifford has been appointed a director of Drake & Gorham (Contractors), Ltd. After his apprenticeship at Croydon power station, Mr. Clifford served as an electrical officer in the Royal Navy during the latter years of the war. On demobilisation in 1946 he entered the Ministry of Works and in 1948 joined the staff of Drake & Gorham (Contractors), Ltd., managing the Winchester branch and subsequently the Newcastle and Manchester offices. The activities of the latter branch will continue under his direct control.

Mr. L. G. Clifford

Mr. R. J. Nixon, M.I.E.E., commercial engineer, No. 3a (Oldham) District, North Western Electricity Board, since vesting date, has retired. Mr. Nixon was educated at Alleyn's College, Dulwich, the Regent Street Polytechnic and Manchester College of Technology. After serving his apprenticeship with the Electrical Apparatus Co., Ltd., he was commissioned in the R.N.A.S. and R.A.F. during the 1914-18 war. From 1923 until nationalisation he served with the Ashton-under-Lyne Electricity Department.

The chairman of the Association of Supervising Electrical Engineers for 1961-62 is **Mr. W. G. D. Gregg,** chief engineer, Ed. R. Buck & Sons, Ltd., of Manchester. He is the patentee of the "Gregg universal ceiling rose."

Mr. W. G. D. Gregg

Mr. P. V. Gurr, formerly manager of the Folkestone District, South Eastern Electricity Board, has been elected chairman of the Folkestone Bench of Magistrates.

The retirement of **Mr. G. H. Walton,** a director of British Insulated Callender's Construction Co., Ltd., and of Painter Bros., Ltd., both members of the B.I.C.C. Group, is announced. He had served with the Group and its predecessors for more than 47 years. Mr. Walton, who is also a former director of British Insulated Callender's (Submarine Cables), Ltd., and of Engineering Products, Ltd., relinquished his executive duties as joint general manager of the British Insulated Callender's Construction Co., Ltd., in 1958 but he continued as a director and undertook special assignments. Mr. Walton joined the former British Insulated & Helsby Cables, Ltd., in 1914. He subsequently became deputy contracts manager of the company and manager of the Helsby factory. In 1948 he was appointed director and general manager of the Radio Gramophone Development Co., Ltd., formerly owned by the B.I.C.C. Group, and later became executive director of the B.I.C. Construction Co. He was appointed director and joint general manager of the company in 1956.

Mr. M. L. Ridgway is joining the Modern Equipment Co., Ltd., on 4th September as export manager.

OBITUARY

Dr. W. A. Macfarlane.—The death occurred suddenly at his home at St. Albans on 19th August of Mr. William Angus Macfarlane, C.B.E., B.A., B.Sc., Ph.D., F.Inst.F., president of the Institute of Fuel and managing director of the National Industrial Fuel Efficiency Service. Dr. Macfarlane, who was born at Weston-super-Mare in 1908, graduated at Balliol College, Oxford, and spent two years at the University of California. He joined the Fuel Research Station of the Department of Scientific and Industrial Research from which he took up an appointment with the L.M.S. Railway under Sir Harold Hartley as senior chemist. Later he joined the Ministry of Fuel and Power in which he became the first Director of Fuel Efficiency.

From 1948 to 1954 he was director of the United Kingdom Scientific Mission in North America and Attaché for Scientific Questions at the British Embassy, Washington. He had served on the Council of the Institute of Fuel since 1947, was vice-president from 1955 to 1958 and became president last October.

Mr. C. W. Langmaid.—The death occurred suddenly on 15th August of Mr. Claude William Langmaid, Associate I.E.E., first assistant district engineer, North-East Suffolk District, Eastern Electricity Board. Mr. Langmaid was born at Bawdsey, Suffolk, in 1899. He received his training with the East Anglian Electric Supply Co. and from 1934 to 1948 was district manager, Halesworth.

Mr. G. Hayman.—The death has occurred, at the age of 68, of Mr. Gilbert Hayman, a partner in the firm of A. G. Arnold & Son, Ltd., electrical contractors, of Newport, Mon. Mr. Hayman joined the firm as an apprentice 53 years ago and was made a partner in 1942.

Mr. J. J. H. Twyman, Western area manager of Radyne, Ltd., has died as the result of a motor accident.

Radiant Heating Booklet

In addition to explaining the principles of radiant heating using piped hot water or electric cables in comparison with convection methods, the new Copper Development Association publication No. 60 provides information on the layout and installation of all forms and applications of radiant panel heating. Heating calculations of a representative dwelling are included, together with tables of heat transmittance co-efficients, rated outputs, heat losses, etc. A large number of illustrations of installation examples and several layout plans are included and are available from the Association at 55, South Audley Street, London, W.1.

INDUSTRIAL NEWS

Appliance Testing Specifications

THREE more sections of B.S. 3456, "Testing and Approval of Domestic Electrical Appliances" have been issued: they are Section A8, Electric Immersion Heaters (formerly B.S. 1556); Section A9, Electric Irons (formerly B.S. 1732: Part 1); and Section A10, Electric Steam Irons (formerly B.S. 1732: Part 2). All British Standards for domestic electrical appliances are being re-issued as sections of B.S. 3456, the object being to facilitate the work of the British Electrical Approvals Board for Domestic Appliances. These sections are concerned with design and construction insofar as they affect safety, durability and reliability in service. Performance tests are excluded and for that reason, the performance tests laid down in B.S. 1556 for immersion heaters are not specified in Section A8. They have, however, been reproduced as appendices. Also in appendices are dimensions of two types of standard head and the methods of fixing which were given in B.S. 1556.

All immersion heaters, electric irons and electric steam irons claimed to comply with these sections of B.S. 3456 must bear the certificated mark of the British Electrical Approvals Board for Domestic Appliances which may be used by manufacturers only under licence from the B.E.A.B. Copies of these sections may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1 (prices: A8 5s, A9 4s 6d and A10 5s, postage extra for non-subscribers).

CARDIFF'S D.C. SUPPLY ENDED

Direct current supplies in the city of Cardiff ceased on Tuesday last. In the presence of the Lord Mayor (Alderman E. Ewart Pearce) the chairman of the Board (Mr. W. A. Gallon) and senior officials of the Board and the Cardiff Corporation, Mr. Edward Jones, who was city electrical engineer from 1934 to 1948, and deputy chairman of the Board until 1952, pressed the button which shut down the last rotary convertor to run in the substation in the basement of the showroom and offices at The Hayes. Also present was Mr. A. E. Gough, who was for many years chairman of the Corporation's Electricity Committee. The ceremony marked the completion of the task started in 1930, interrupted by the second world war, and accelerated since 1954, of changing some 5,000 d.c. consumers over to the standard a.c. network.

Cabling for Kincardine

Associated Electrical Industries, Ltd., has been awarded a £171,000 contract for the supply and installation of cables and accessories, including cable supporting steelwork, for two 200 MW generating sets at Kincardine "B" power station. The work will be carried out by the A.E.I. Construction (Cables and Lines) Division for the South of Scotland Electricity Board. Consulting engineers for the project are Messrs. Kennedy & Donkin.

ELECTRON BEAM WELDING

ALTHOUGH its use will not be confined to the aircraft industry, a new fusion welding process using an electron beam is to be demonstrated by Sciaky Electric Welding Machines, Ltd., at the S.B.A.C. Exhibition at Farnborough next week. In this process, the joint is produced by the local heating of the base metal only or a filler metal may be introduced. The necessary heat is provided by bombarding the workpiece by a dense beam of high-velocity electrons. The process is carried out in a high vacuum chamber and the plant consists of the chamber, a vacuum pump system, an electron gun, a mechanism for remotely manipulating the gun and the worktable without breaking the vacuum, a high-voltage power supply and an electrical control gear. This form of welding is suitable for use with the refractory metals—tungsten, molybdenum, columbium, tantalum, etc.—and the highly oxidisable metals—titanium, beryllium, zirconium, uranium, etc.—although any weldable metal or alloy and certain ceramics can be fused by this process. The equipment may also be used for melting, grain refining, stress relieving, cutting, metallising and vacuum brazing.

Technical Block Lighting

ILLUMINATION in the drawing office of the recently completed technical laboratories of Hepworth & Grandage, Ltd., Bradford, is provided by equipment supplied by the A.E.I. Lamp & Lighting Co., Ltd. Over 60 twin-lamp 5ft fluorescent fittings are mounted directly on "Invertrunking" in five continuous rows of 7ft centres to give a lighting level of 80 lumens/sq ft on the drawing boards. The order, worth over £4,000, includes half a mile of "Invertrunking" and shallow trunking and more than 300 fluorescent and tungsten fittings. Lighting in the test panel corridor is by sixteen 5ft 80 W single-lamp Monolux fittings, and the engine room is illuminated by two rows of eight single-lamp 5ft Monolux fluorescent fittings.

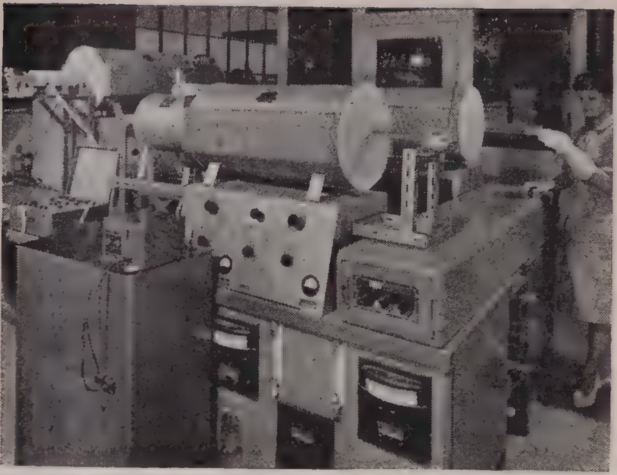
The forecourt of the new laboratories has been lighted by Mazda four-lamp 2ft 40 W SLX 3523 post-top lanterns.

Lighting equipment in the new technical block of Hepworth & Grandage, Ltd., has been supplied by A.E.I. Lamp & Lighting Co., Ltd.

SEMICONDUCTOR NETWORKS

AT a meeting last week Texas Instruments, Ltd., announced that they are actively pursuing a semiconductor networks development programme.

Dr. J. A. Powell, head of the Transistor Department, presided and talks were given by Mr. J. S. Walker, who heads the semiconductor network activity at Texas Instruments, assisted by Messrs. M. W. Larkin and P. H. Stephens. The topics covered the technologies, the reliability, and encapsulation of semiconductor networks and their application. A brief survey was made by Mr. G. W. A. Dummer, of the Royal Radar Establishment, who proposed in 1952 that a complete circuit could be made from a single block of material containing insulating and conducting materials.



Part of the Texas Instruments semiconductor line at Bedford. Diffusing impurities into silicon wafers

There was discussion of the types of circuits, potential reliability, implications in system design, form of encapsulation and the programme upon which the company was embarking. Sample quantities of networks will be available within about 12 months and production at prices competitive with conventional electronic circuits is expected in two or three years' time.

Mr. A. N. Provost, managing director, expressed his pleasure at the interest shown in all aspects of the subject and said that work on semiconductor networks would proceed quickly at the Bedford plant.

G.E.C. Group Organisation

A NEW distribution system to improve the service given to wholesalers and contractors was announced this week by Mr. R. H. Phillips, managing director of the G.E.C. Installation Equipment Group. He said that there would be direct control of the distribution of the Group's products; larger depots of its own would replace the shared depots of the old G.E.C. network before the end of September.

From six large depots, in London, Glasgow, Birmingham, Leeds, Preston and Gloucester, the Group would be able to step up its deliveries to customers throughout the United Kingdom. The London depot would also provide service for export customers.

Each distribution centre would carry considerable stocks of Pirelli-General cables, G.E.C. low voltage switch-fuse gear, contactors, fuses, conduit, trunking and associated fittings and wiring accessories. The depots would be mechanised as far as possible.

Mr. Phillips added that the Group was determined to accelerate its sales policy of distributing mainly through wholesalers.

The Central, North and South London sales areas of the G.E.C. Lighting and Heating Group have been merged into one organisation with headquarters at London Area Sales Office, Lena Gardens, Hammersmith, W.6 (telephone: Riverside 4671).

The new organisation is headed by Mr. S. E. Mason, previously manager, Central London area. Mr. J. T. Mellor becomes manager, technical services; Mr. T. E. Pickering, area chief lighting engineer; and Mr. G. W. Findlay, area chief heating engineer.

The group's offices and trade counter service at Hanger Lane, Ealing, W.5, have been withdrawn.

Irish Electricity Strike

In a statement last Monday on the strike of power station workers in Ireland the Electricity Supply Board said "The present situation is that with 17 power stations in operation adequate supplies of electricity are available throughout the day and night except during the peak period from 11.30 a.m. to 1 p.m. when maximum economy by domestic and industrial consumers is essential."

The Electrical Trades Union (Ireland) and the other union involved, the Irish Engineering, Industrial and Electrical Trades Union, have conducted a ballot among the strikers on a new pay offer. The E.T.U. has called upon supervisory staffs to support the strikers.

D.S.I.R. HEADQUARTERS MOVES

The headquarters of the Department of Scientific and Industrial Research is now at State House, High Holborn, London, W.C.1 (telephone: Chancery 1262). State House is a new 15-storey block about three minutes' walk from Holborn Underground Station on the north side of High Holborn.

Computer at Cardiff University

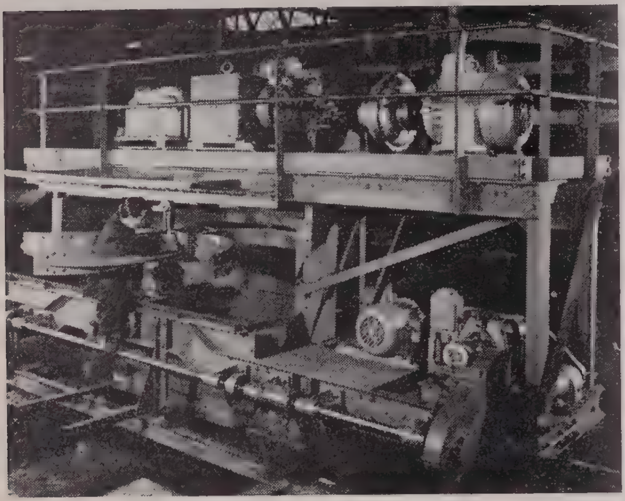
A transistorised "Stantec" computing system, made by Standard Telephones & Cables, Ltd., was installed last week at the University College of South Wales and Monmouthshire, in Cardiff. The main computer activity at Cardiff University will be in the field of crystallographic research, for which this University is noted. Eventually, other Departments in the University will make use of the computer, and some time will be available for giving service to outside users.

New York Electronics Factory

To centralise its activities, Ferranti Electric Inc., of New York, has recently opened a new $350,000 electronics factory at Plainview, Long Island, New York. Facilities previously provided at Hempstead and Brooklyn have now been transferred to this 7-acre site which is adequate to allow for future expansion.

The new factory, which covers an area of 50,000 sq ft and employs 150 people, is engaged primarily in the manufacture of magnetostriction delay lines and small transformers. Test and demonstration facilities are provided for other products, such as viscometers, tape readers, aircraft instruments and cathode-ray tubes, imported from the parent company in the United Kingdom, Ferranti, Ltd.

Coal Handling at Richborough



One of two paddle feeders for Richborough power station just before dispatch from the Erith Engineering Works of G.E.C.

TWO identical 650 tons/hr paddle feeders for installation in the Central Electricity Generating Board's new 360 MW power station at Richborough, Kent, have just been dispatched from the Erith Engineering Works of the General Electric Co., Ltd. The order was received through the Mechanical and Electrical Engineering Division of George Wimpey & Co., Ltd., the main contractors for the coal-handling plant.

One of the paddle feeders will be installed beneath a 90ft long slot-discharge hopper in the coal-storage area. The other will normally act as a standby unit, but there will be provision for it to operate on the same set of rails as the first unit to assist in unloading the hopper.

Translucent Ceiling

A LARGE pressurised clean room is now nearing completion at the Stockport (Cheshire) premises of Fairey Engineering, Ltd. The room has an area of 19,000 sq ft, over the whole of which an airtight translucent ceiling has been fitted. This "clean area" will be used for the final assembly of control rod and burst slug detection gear to be installed in the nuclear power station now being built at Trawsfynydd by Atomic Power Constructions, Ltd. The ceiling was supplied by Isora Illuminating Ceilings, Ltd., and consists of a light steel grid suspended from the existing roof trusses. This grid carries the translucent panels, each of which is individually clipped down on to a plastic sealing strip so that an airtight seal is formed. Every panel can, however, be removed if access to the void above is necessary.

PACKAGING DIRECTORY

The fourteenth issue of the annual "Packaging Directory" has been published by the Tudor Press, Ltd., 75, Carter Lane, London, E.C.4, price 21s. Over 800 main and 3,250 sub-divisional entries in the index to the Buyers' Guide cover packaging materials, types of container and packaging machinery. The Buyers' Directory deals with containers and closures, materials, packaging machinery and equipment and services. Also listed are 164 official organisations, 13 international design organisations, 71 packaging consultants, some 250 foreign firms, nearly 3,000 trade names and there is a section dealing with forthcoming exhibitions.

Purchase Tax on Storage Heaters

Thermodare (Great Britain) inform us that as from today (1st September) all storage heaters will be subject to purchase tax. The new prices of Thermodare storage heaters (including purchase tax and surcharge) are as follows:—

Industrial models: L10, £16 0s 10d; LV15, £18 10s 2d; LV20, £21 11s 10d; LH15, £20 7s 2d; LH20, £22 16s 6d; L30, £27 15s 3d. Domestic model: D25, £22 18s.

Refrigerator Makers Dismiss Employees

More than 200 production workers at Electrolux, Ltd., Luton, have been dismissed. The company, which earlier this month warned the men that there would be "redundancies," said that refrigerator sales had been affected by the "credit squeeze."

Notice has also been given to about 200 employees at the Liverpool factory of the English Electric Co., Ltd. The management has stated that the number would have been greater if it had not been possible to transfer workers to other departments.

B.I.M. CONFERENCE

A critical European view of British marketing methods, an appraisal of modern industrial relations, the successes and failures of a small firm, problems of a large multi-unit organisation, management training, research, and government policies and industry will be among the subjects examined and discussed at the sixteenth national conference of the British Institute of Management, to be held at Torquay from 24th to 26th October.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £186 0s 0d
COPPER, H.C. Electro	ton £232 2s 6d
Fire Refined 99·70%	ton £231 0s 0d
Fire Refined 99·50%	ton £230 0s 0d
COPPER Tubes ..	lb 2s 3⅜d
Sheet	ton £265 5s 0d
H.C. Wire and strip	ton £283 5s 0d
LEAD, English ..	ton £55 7s 6d
Foreign	ton £64 0s 0d
MERCURY	flask £63 0s 0d
TIN, block (English) ..	ton £982 0s 0d
ZINC, G.O.B. Foreign	ton £75 16s 3d
BRASS Tubes (solid drawn)	lb 1s 9⅞d
Wire	lb 2s 8½d
PHOSPHOR BRONZE Wire	lb 4s 2½d
PLATINUM	oz £30 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 25¼d—25½d

Semiconductors, Ltd.

Following the recent announcement that Semiconductors, Ltd., had become a wholly-owned subsidiary of the Plessey Co., Ltd., the formation of a reconstituted board of directors is announced as follows:—Sir Allen Clark (chairman), Mr. John A. Clark, Dr. J. Reekie, Mr. D. H. Roberts, Mr. G. C. Gaut and Mr. G. Campbell.

FROM TEXAS

Si CONTROLLED RECTIFIERS

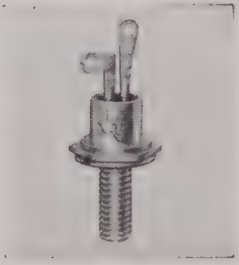
with
SMALLEST triggering power requirements
LOWEST quantity prices
LARGEST availability

IN PRODUCTION QUANTITIES NOW!

The TEXAS 1S600 Series

3 Amps....50 to 400 Volts
Turn-on gate current 5mA typical

A series of high performance 3A Silicon Controlled Rectifiers at quantity production prices, now. Five devices are offered in the series, with peak inverse voltage ratings from 50 to 400 volts over a stud temperature range from —65°C to +125°C. Typical gate current required to turn-on is only 5mA.



ACTUAL SIZE

These devices are PNPN, three terminal, solid state thyratrons housed in metal cases, with anode connected to stud—the only such device available in quantity NOW.

For Induction Motor Speed Control · D.C. to A.C. Conversion · Power Switching

TYPE	MAXIMUM RATINGS				TYPICAL CHARACTERISTICS		
	P.I.V.	Average Rectified Forward Current @75°C	Average Rectified Forward Current @125°C	Recurrent Peak Forward Current	Reverse Leakage Current	Holding Current	Gate "Turn-on" Current
1S600	50 V	3 A	1 A	10 A	1 mA	5 mA	5 mA
1S601	100 V						
1S602	200 V						
1S603	300 V						
1S604	400 V						

TEXAS INSTRUMENTS
LIMITED
MANTON LANE · BEDFORD · ENGLAND
BEDFORD 67466 · CABLES: TEXINLIM, BEDFORD

91/A24

We are
the largest
manufacturers
and suppliers of
electrical insulating
materials in the range
we cover and the
variety of our
products

"SAMICA" "PAXOLIN" and "PANILAX"
are registered trade marks.
"Terylene" is a registered
trade mark of I.C.I.

MICA; block splittings and fabricated parts.

MICANITE; built-up mica insulation of every type in the form of sheets, tubes, cylinders, V-rings, covered bars, segment separators, fabricated parts, etc.

"SAMICA"; of mica paper insulation.

"PAXOLIN"; synthetic resin-bonded laminates having paper, fabric, glass, nylon, asbestos or other fillers are bonded with epoxide, melamine, phenolic, silicone or other resins to produce various grades for punching, moulding or machining.

SILICONE INSULATION; a range of materials for Class H applications; silicone glass fabric, silicone-bonded glass laminates, silicone-bonded Micanite sheets, tubes, V-rings, etc., silicone glass/mica tapes; silicone combination insulation and silicone elastomer tapes.

EMPIRE VARNISHED INSULATION; paper, cotton, silk, Terylene, nylon and glass in the form of sheets and tapes treated with various impregnants including ethoxyline.

COPPER FACED PAXOLIN;

HIGH VOLTAGE BUSHINGS & INSULATORS; for all voltage ratings and for indoor and outdoor equipment.

TRANSFORMER CYLINDERS;

"PANILAX"; (aniline-formaldehyde) resin mouldings.

VULCANISED FIBRE; sheets, tubes, rods and fabricated parts.

LEATHEROID; sheets, rolls and punched parts.

PVC POLYTHENE & OTHER THERMOPLASTICS; extrusions and injection mouldings of all types including PVC sleevings.

m and i **the electrical insulation people** MIC

THE MICANITE & INSULATORS CO., LTD.,
BLACKHORSE LANE, WALTHAMSTOW, LONDON, E17

TEL: LARKSWOOD 5500 GRAMS: MYTILITE, LONDON, TELEX. TELEX: 25183.

Rotary Switch Production

Austinlite switch assembly section. In the foreground a heavy duty switch is being measured for contact resistance

EXTENSIONS to their factory at Malvern, Worcestershire, have enabled Austinlite, Ltd., a Stone-Platt subsidiary, to concentrate the production of rotary switches and marginal relays there. The Malvern factory is now a self-contained unit with its own design, commercial and accounting sections, all of which have been recently transferred from the Stone-Chance works at Crawley. The immediate target is a 50 per cent increase in production. The manufacture of Austinlite emergency standby generating plant remains at Crawley.

A new brochure describes and illustrates the complete range of switches covering from 15 to 550 A, with both slow and quick make-and-break mechanism.

New E.D.A. Publications

A number of new and revised publications dealing with the use of electricity in agriculture and horticulture have been issued by the Electrical Development Association. They include the following:—" Electricity on the Farm," a ten-page pamphlet giving brief information on the main applications of electricity on the farm; " Electricity for Green Crop Conservation," a revised folder giving detailed comparative costs of making and feeding hay; " Controlled Potato Chitting," the thirteenth E.D.A. agricultural broadsheet giving brief but basic information on subjects covered more fully by the Association's technical books; and " Tomato Propagation by Electricity " and " Electric Bench Warming," two 4-page leaflets for the commercial grower and smallholder.

All these publications can be obtained from Electricity Board Service Centres or direct from E.D.A., 2, Savoy Hill, London, W.C.2.

R.E.C.M.F. Stockholm Show

The Fourth Stockholm Exhibition of Radio and Electronic Components, Instruments and Gramophone Equipment, organised by the Radio and Electronic Component Manufacturers' Federation, will be held in Ostermans Marmorhallar, Birger Jarlsgatan 18, Stockholm, Sweden, from 9th to 13th October.

The Show, which will be opened by the British Ambassador to Sweden, will be the largest and most comprehensive yet organised abroad by the R.E.C.M.F., and 10,000 invitations are being circulated throughout the Scandinavian and Northern European countries.

Australian Sales Tax Reduced

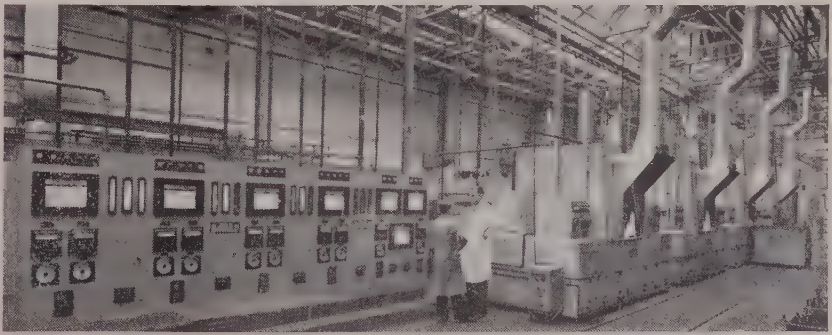
The Australian budget introduced in Canberra recently contains proposals for a reduction in sales tax from 8⅓ to 2½ per cent on a wide range of domestic electrical appliances including refrigerators, washing machines, vacuum cleaners, heaters and electrical fittings.

Electrochemical Machining

A NEW company, Metachemical Machines, Ltd., has been formed by B.S.A. Tools, Ltd., and Metachemical Processes, Ltd., on an equal partnership basis to develop the production technique of electrochemical machining, a method of producing shapes in metal by means of an electric current and a stream of electrolyte. The technique originated in research sponsored by the Steel Improvement & Forge Co., Ltd., of Cleveland, Ohio, of which Metachemical Processes, Ltd., are the British associates.

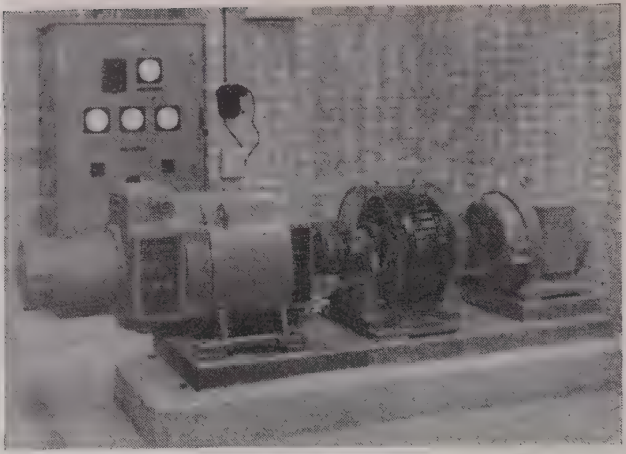
While the scientific work of the new company will be carried out at its Crawley headquarters, production will be undertaken initially by the Kemworthy Jig & Press Tool Co., Morden, Surrey, which Metachemical Machines, Ltd., has acquired as a wholly-owned subsidiary. On the home market the new company's products will be sold by Burton, Griffiths & Co., Ltd., Kitts Green, Birmingham, the U.K. selling organisation of the B.S.A. Tools Group. Sales in overseas markets will be organised through the existing export network of B.S.A. Tools, Ltd.

CARBURISING PLANT



Automatic carburising and carbo-nitriding is provided at the Fletchamstead works of Standard-Triumph where gear wheels emerge from four single zone Wild-Barfield furnaces dimensionally very accurate and suitable for assembly without further treatment. A similar scheme has been completed at the company's Radford works. Honeywell instrumentation forms the basis of the control systems

Frequency Stabilised Computer Supply



Crompton Parkinson motor alternator set supplying a computer

A STABILISED frequency power supply for the Univac computer operating in the new Remington Rand, Ltd., premises at Holborn Viaduct is obtained from a Crompton Parkinson motor alternator set. This comprises a squirrel cage induction motor, a Heenan "Dynamatic" coupling and a 40 kVA, 240 V, single-phase, three-wire, 60 c/s, self-regulating alternator. A separate 415 V, three-phase, 50 c/s feeder was installed between the building substation and the basement plant room, terminating in a composite airbreak type control panel adjacent to the motor alternator set. The alternator frequency is maintained under transient and steady state conditions within ± 0·5 per cent of 60 c/s with grid supply variations of 48-51 c/s and ± 6 per cent of 415 V. The voltage reference of the alternator is connected at the load point and the voltage regulation in the computer room is maintained within ± 5 per cent under all load conditions.

Recent Orders

The Motor and Control Gear Division of Associated Electrical Industries, Ltd., has obtained an order for the complete electrical and electronic equipment needed to drive and control a machine to produce wallpaper at rates of up to 1,200ft/min. Wall Paper Manufacturers, Ltd., Darwen, Lancs., are reconstructing their No. 1 machine at Hollins Mill and the new equipment consists of a 9-section electrical drive which includes two motor-generator sets, one having four generators with a total output of 342 kW and the other having five generators totalling 306 kW.

Speeds between adjacent sections of the paper making machine will be held to within ±0·1 per cent. This high accuracy is achieved by an A.E.I. patented system known as the "Metrolock," a magnetic amplifier closed-loop speed-control system.

The General Electric Co., Ltd., has been awarded the contract to supply a radio link for Cable & Wireless, Ltd., between the Jamaican terminal of the United States-Jamaica submarine cable at "7 mile point" and the Central Telegraph Office in Kingston.

The equipment selected for this project operates in the 2,000 Mc/s frequency band and is capable of carrying up to 240 speech circuits per radio channel. The system consists of a main and a standby radio channels with automatic change-over in the event of a failure.

A £300,000 contract for electrically-welded finned steel tube for the Dungeness nuclear power station has been received by Tube Products, Ltd.

An order has been received by the Traction Division of Associated Electrical Industries, Ltd., through A.E.I. South Africa (Pty.), Ltd., for three 2ft gauge, 28-ton, 500 V underground locomotives for Goldfields of South Africa.

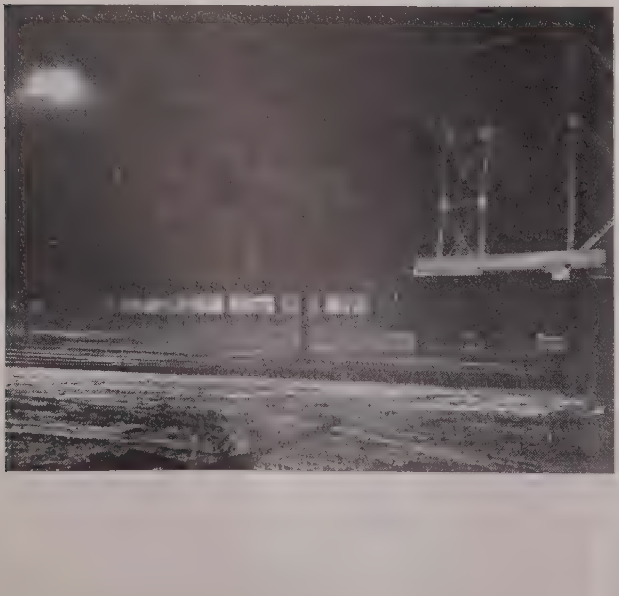
Aircraft Equipment Factory

The Aircraft Electrical Division of the Plessey Co., Ltd., has started operations in the £507,000 factory at Eastern Avenue, Romford, which was acquired from Regentone Products, Ltd., in May. It is expected that by the end of the year some 700 people will be working there, and within three years the company is hoping to recruit 200 additional engineers, designers, operatives and administration staff, bringing the overall number to about 900. To help meet the immediate problem of extra personnel, a training scheme is being instituted. The products to be made include actuators, static and rotary invertors, motors, relays and temperature controllers.

Extensions to Kidsgrove Works

Taylor Woodrow Construction, Ltd., has been awarded a contract valued at approximately £300,000 by the English Electric Co., Ltd., to carry out additional work at the company's Kidsgrove Works, Stoke-on-Trent. It involves the construction of a single-storey factory and two-storey office block.

Mercury Floodlighting at Walton Colliery



High-tower floodlighting of large areas is usually carried out by tungsten lamps. This installation at Walton Colliery uses a total of 15 Philips mercury floodlighting projectors containing 1,000 W MB/U lamps mounted on eight towers. The advantages of the high-pressure mercury lamp are long life and high efficiency, and the weather-resistant fittings are reported to require little maintenance

CO-OPERATION IN RETAILING

The National Electrical Contractors' Trading Association (N.E.C.T.A., Ltd.) and the Radio and Television Retailers' Association have recently had several discussions concerning retailing generally. As a result it has been decided that a joint co-operation committee shall be established between the two Associations in order to advise their members on matters of mutual interest. It is hoped that after further meetings a more detailed announcement will be made.

Semiconductor Slide Rule

A slide rule which enables rapid selection to be made of the correct peak inverse voltage diode required wherever a circuit involves the use of either single- or three-phase bridge rectification is available, price £1 post free, from International Rectifier Co. (G.B.), Ltd., Hurst Green, Oxted, Surrey. By setting a scale on the reverse of the slide to the b.c. working voltage the rule automatically gives the r.m.s. input voltage and the correct p.i.v., including a "built in" safety factor. A second factor on the face gives the minimum p.i.v. that can be employed where all transients are known to be suppressed. The back of the rule is printed with information on ripple factor, a.c. to d.c. ratios and utility factor.

INDUSTRIAL ELECTRICITY GENERATION

The accompanying table, issued by the Ministry of Power, analyses the generation of electricity outside the public supply system in the first half of the year.

It will be seen that there was a further substantial increase in production at the nuclear power stations of the United Kingdom Atomic Energy Authority, classified under the chemical industry. Coal mines, gas works and petroleum refineries are not included in the return.

Industry	26 weeks ended 1st July	Change %
	Million kWh	
Chemicals:		
Nuclear Power Stations ...	1,146·0	+19·3
Other	1,817·8	+ 2·2
Iron and Steel	1,399·3	+ 1·0
Engineering	682·8	− 6·8
Textiles, leather and clothing	275·5	− 6·8
Food, drink and tobacco ...	195·2	+15·2
Paper	1,213·6	+ 2·0
Other industries	227·4	− 3·0
Total for industry ...	6,957·6	+ 3·1
Transport undertakings ...	458·3	− 5·4
TOTAL	7,416·3	+ 2·6

Electricity in Horticulture

GIANT tomato plants propagated by electricity in midwinter were again shown on the electricity stand at this year's Southport Flower Show from Wednesday to Friday last week. The stand, arranged by the Merseyside and North Wales Electricity Board in conjunction with the British Electrical Development Association, also had sections dealing with the following subjects:—Early tomato production; begonia propagation by light therapy; heat therapy for chrysanthemums; small-scale hydro cooling; bulb forcing; and mist propagation. An all-electric greenhouse specially designed for the amateur gardener was also shown.

EXPERIMENTAL HOT BOX IN OPERATION
for the Heat Treatment of Chrysanthemums

One of the exhibits which formed part of the electricity stand at Southport Flower Show—an experimental hot box in which chrysanthemum plants have been forced at the pace necessary to produce cuttings free from Aspermy virus

TRADE ANNOUNCEMENTS

The **Benjamin Electric, Ltd.,** is opening new Scottish offices on 5th September at 259, St. Vincent Street, Glasgow, C.2, where a selection of industrial and commercial lighting fittings for fluorescent tube, tungsten and mercury lamps will be displayed permanently as well as a complete range of outdoor fittings and floodlights. Mr. J. M. Anderson, recently appointed area manager for Scotland and Northern Ireland, will be based at the new offices.

Vactric Control Equipment, Ltd., whose share capital was recently acquired by the "News of the World" Organisation, has purchased premises at Garth Road, Morden, Surrey, where a new block is to be erected to house the Development and Applied Research Departments. As additional space becomes available, the company will gradually concentrate all its activities into this area.

Crofts (Engineers), Ltd., power transmission engineers, Bradford, have extended their stockholding service to their London branch. Extensive modifications have been made to 36/42, Tanner Street, Bermondsey, London, S.E.1 (telephone: Hop 7751/4) including an attractive showroom displaying the company's stock products and a representative selection of specialised products. Similar branches are already operating in Manchester, Birmingham and Leeds. The technical and estimating service is being further augmented at the new offices under the management of the London director, Mr. H. W. Cameron.

Electro Mechanisms, Ltd., 220, Bedford Avenue, Slough, Bucks., have formed a link with Schaevitz Engineering, of Pennsauken, New Jersey, U.S.A., and Mr. Herman Schaevitz and Mr. Louis Bernant (U.S.A.) have joined the board. The Electro Mechanisms range of transducers and amplifiers will now be augmented by the Schaevitz linear and rotary differential transformers, dynamometers, transducers and centrifuges. The agreement provides for the full exchange of technical information.

The **Provincial Wholesale Co., Ltd.,** has transferred its office, stores and warehouse from 21, Copeland Street to South Wolfe Street, Stoke-on-Trent (telephone: Stoke 44945).

The address of **Parvalux Electric Motors, Ltd.,** is now Wallisdown Road, Bournemouth (telephone: Winton 4983/4).

NEW ELECTRICAL EQUIPMENT

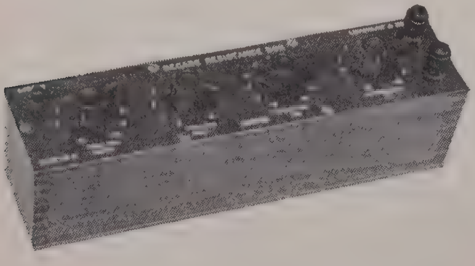
POLYSTYRENE CAPACITORS

A range of close-tolerance polystyrene capacitors is announced by the Capacitors and Resistors Division, the PLESSEY CO., LTD., Ilford, Essex.

The standard unprotected polystyrene capacitors are normally restricted to an upper temperature limit of about 70°C because of the risk of deformation as the softening temperature is approached. Encapsulation reduces the risk of deformation and the rated temperature limit can be raised to 85°C. The capacitance range in the new series is from 10 pF to 0·22 μF. Higher values up to 0·5 μF, non-encapsulated, are available and a range of aluminium cased types covering the higher capacitance values is also being marketed. Working voltages for the encapsulated and unprotected capacitors are 125, 350, 500, 750 and 1,000 V. Encapsulated types are also available for operation at 2,000 V. Typical insulation resistance and power factor values are 10^6 MΩ and 0·005 respectively.

DECADE RESISTANCE BOX

The decade resistance box type RD2 announced by LIONMOUNT & CO., LTD., 40, Hatton Garden, London, E.C.1, is a switched unit covering the range 1 to 10,000 Ω with four dials. The resistors are non-inductively wire wound with a copper-nickel alloy, and have been temperature stabilised. The maximum current marking on each decade, 600, 200, 60 and 20 mA, indicates the maximum continuous current permitted, but this value may be exceeded by 50 per cent for short periods. The accuracy of adjustment is better than 0·2 per cent at 20°C, except for the lowest decade for which it is 1 per cent. Switches having a minimum contact resistance of less than 6 mΩ are used. The instrument has a mahogany case with a $\frac{3}{16}$in thick stove enamelled front panel. An internal aluminium liner is fitted which makes contact with the front panel, providing a totally enclosed screening for the switches.



(Above) Lionmount type RD2 decade resistance box

GLASS-FIBRE INSULATED CABLE

A flexible glass-fibre insulated cable for use as a lighting fitting connection is announced by BRITISH INSULATED CALLENDER'S CABLES, LTD., 21, Bloomsbury Street, London, W.C.1. It is suitable for 250 V operation and is designed to function at the high temperatures likely to be encountered in certain contemporary lighting fixtures. The cable will continue to function if subjected to an external source of heat up to 180°C.

OVERHEAD LINE TESTER

An overhead line tester has been developed by the WESTMINSTER ENGINEERING CO., LTD., Victoria Road, London, N.W.10, in conjunction with British Railways for use on the new 25 kV and 6·25 kV electrified sections of the Eastern Region. The device consists of four sections of glass fibre tube, the lower three being for use on lower line heights while the fourth is required for conductors above 18ft from rail level. The upper sections are both supplied with a hook, so that the device can be hung on the line. In the second section is a neon tube covered with a daylight shield to cut out direct sunlight. A capacitor tested at 40 kV is positioned on the live side of the neon tube for safety. The lowest section is equipped with flexible cable, which is connected to a permanent magnet for attachment to the running rail, as an added safety measure against surface leakage in damp conditions. The equipment is light and fits into a canvas carrying case 4ft long.

(Right) Westminster Engineering overhead line tester

AUTOMATIC VOLTAGE STABILISER

The type TS-1 a.c. voltage stabiliser produced by CLAUDE LYONS, LTD., Valley Works, Ware Road, Hoddesdon, Herts., provides rapid, accurate and distortionless stabilisation over an input voltage range of 25 per cent, with an output of approximately 1 kVA. An alternative connection gives approximately 2 kVA output with 12½ per cent input range. It comprises a motor-driven "Variac" variable transformer, controlling the primary of an auxiliary "buck-and-boost" transformer, the secondary of which is connected in series with the supply, so as to inject a variable aiding or opposing voltage to correct for any error. The motorised "Variac" is automatically positioned by a transistorised sensor unit, to maintain the output voltage at the required value. The output voltage setting may be any value between 200 and 254 V. The plug-in sensor unit is a transistorised servo-amplifier which continuously monitors the stabilised output voltage, a rectified sample of which is compared with a zener diode reference. The error voltage is amplified and applied to a pair of transistors controlling the armature supply to the d.c. servo-motor, the field of which is continuously excited.

The stabiliser is provided with a dual-range "buck-and-boost" transformer having two secondaries, which can be connected in series or in parallel. With parallel connection, a high power rating is obtained, with range sufficient to compensate for supply voltage variations within the statutory limits of ±6 per cent. With series connection, the same unit provides a wide correction range. With each connection three different input voltage ranges can be selected by tappings provided on the "Variac."

Solartron transistor power supply

Westool "Sonac" sonic control equipment

For series connection these ranges are −17½ to +7½ per cent, ±12½ per cent, and −7½ to +17½ per cent. The correction range in parallel connection is half that for series connection. Input voltages can be accepted from 165-215 V to 231-294 V at 47-65 c/s. The correction accuracy is better than ±0·5 per cent, zero to full load, and the speed of correction is 40 V/sec. The output current with series connection is 4 A (0·96 kVA nominal at 240 V output setting) and with parallel connection is 8 A (1·92 kVA nominal at 240 V output setting).

MOTOR CONTROL CENTRE

Several improvements have been incorporated in the motor control centre marketed some three years ago by the **General Electric Co., Ltd.** Starters up to 150 h.p. and switchfuses up to 200 A can now be accommodated with no increase in the overall cubicle size. A duplex design in which the starter trays are mounted on both fronts, saving a space of 6in over two single-fronted cubicles mounted back-to-back, has also been introduced. A revised pamphlet, Technical Description No. 445, dealing with this type of switchgear is available from the company's Witton publicity department, Birmingham, 6.

TRANSISTOR POWER SUPPLY

The power unit type AS 1164 announced by **Solartron Laboratory Instruments, Ltd.**, Cox Lane, Chessington, Surrey, comprises twin 0-30 V "floating" supplies each of 1 A capacity. The outputs are independently adjustable in 0·1 V increments by decade switching. They can be used separately as positive and negative supplies, switched into parallel operation to give 2 A capacity, linked in series to provide a tapped 0-60 V supply or connected back-to-back to give ±30 V—0—±30 V. The accuracy of voltage adjustment is ±2 per cent ±2 mV.

Each supply has separate overload limit selectors (25, 50, 100, 250, 500 mA, 1 A) and current monitoring meters. A fully electronic proportional control system protects the power unit and the circuit it supplies. Overload warning indicators are provided for each supply. In parallel operation there is one set of overriding output level controls, but the current limit selectors remain operative and independent. This doubles the overload limit to 2 A with finer intermediate settings. The stability factor of each output is greater than 1,000 : 1; ripple and noise 1 mV peak to peak and regulation is approximately 0·1 per cent at maximum output. Output impedance is less than 0·35 Ω up to 100 kc/s.

This bench unit weighs 25 lb and has dimensions of 11$\frac{3}{8}$in by 7$\frac{5}{16}$in by 14$\frac{5}{8}$ in. The provisional price is £135.

SUBMINIATURE ZENER DIODES

Subminiature glass zener diodes with a voltage range of from 3·3 to 27 V and rated at 250 mW power dissipation are now available from the **International Rectifier Co. (Great Britain), Ltd.**, Hurst Green, Oxted, Surrey. High stability and excellent voltage regulation over the temperature range from −55°C to +150°C are provided by this new series. Designated types QZ3.3 to QZ27, units are available with both 5 and 10 per cent voltage tolerances, tolerance being specified by adding T10 or T5 to the type number, and they have a maximum zener impedance range from 5 to 70 Ω.

The new devices are process-selected to provide exceptionally sharp zener characteristics. All units have glass-to-metal hermetic sealing for ruggedness and optimum reliability, and measure 0·265 by 0·110 (dia.) inches, not counting leads. The prices for 1 to 49 are 8s 6d each for the T10 and 9s 3d each for the T5 types.

SONIC CONTROL SYSTEM

A sensing and switching system using a 38 kc/s ultrasonic sound beam is now available from **Westool, Ltd.**, St. Helen's Auckland, Co. Durham. The "Sonac" consists of three major parts: a control unit containing a transistorised amplifier, a plug-in output relay, and a power supply; and two hermetically sealed, acoustic sensors 1$\frac{3}{8}$in in diameter by 2$\frac{7}{16}$in long which convert electrical energy to ultrasonic energy and vice versa. One acts as a transmitter, the other as a receiver. The circuits are transistorised and the sensors are of hermetically sealed pod construction. The equipment is not affected by ambient light, dust, industrial contamination, steam, smoke, or vibration and the operating temperature is from −350 to +220°F. The system will detect solids or liquids, opaque or transparent objects, ferrous or non-ferrous metals. A beam several feet wide is possible or it will work through holes down to about 0·03in diameter. The sensors can be concealed or remotely situated as the beam can be conveyed to work areas with flexible tubing.

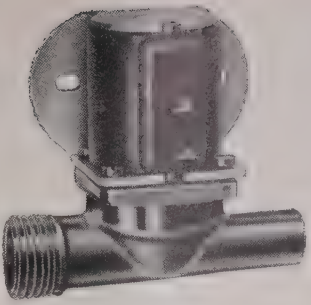
HIGH VACUUM PUMP

An addition to the range of ultra-high vacuum devices produced by **Mullard, Ltd.**, Mullard House, Torrington Place, London, W.C.1, is the VPP-5 Penning pump. This pump is continuous in operation and is based on the principle of the Penning gauge, in which electrons are made to oscillate between cold cathodes. A magnetic field perpendicular to the direction of electron flow causes the electrons to traverse spiral paths as they oscillate in the electrostatic field formed by the cathodes and the anode. Ions produced by these electrons are accelerated to the cathodes and liberate more electrons, the combined action being self-supporting.

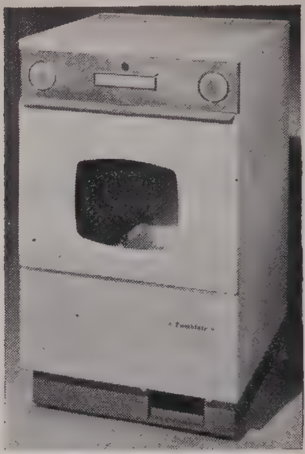
The pump comprises many Penning electrode units in parallel using common titanium cathodes on each side of a nest of anodes. During operation, the titanium sputters from the cathode on to the anodes, forming fresh surfaces which "getter" very actively. The life of the pump is dependent on the amount of titanium available at the cathode for sputtering and is estimated to be 10,000 hr at a pressure of 10^{-6} torr.

The pumping action begins at a

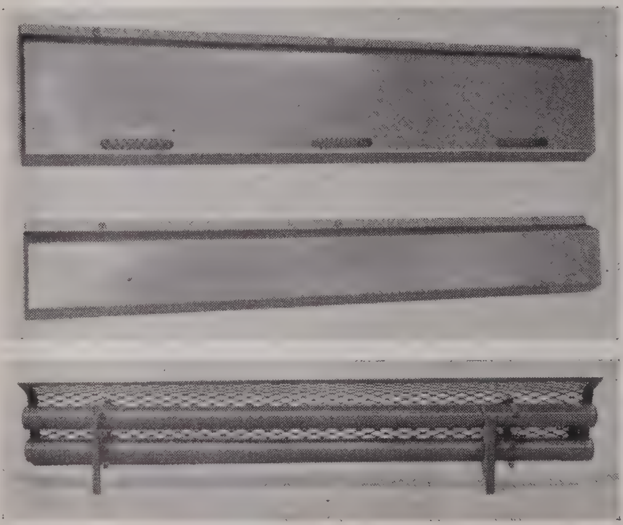
pressure of 5×10^{-2} torr and continues until a pressure down to 10^{-11} torr is reached. Over this range the pumping speed for air is 5 litres/sec. The pump is contained in a stainless steel case with a metal lead-in consisting of a ceramic seal. Each pump is supplied with its own magnet, which can be removed during bake-out. The pump is connected to a vacuum system by a flange and a demountable metal seal. The seal has a $\frac{3}{4}$in orifice and can be baked to a maximum temperature of 500°C.



(Above) Sumlite Controls solenoid valve



Burco model D.3 "Tumblair de Luxe" clothes dryer



Unity Heating ventilated and unventilated skirting panels (above) and a two-way tubular heater fitted with guard

SOLENOID VALVE FOR DOMESTIC APPLIANCES

A new solenoid valve to meet the demand for greater reliability of electro-control and water valve gear on appliances such as washing machines and dish-washers has been introduced by SUMLITE CONTROLS, LTD., The Airport, Pendeford, Wolverhampton. The valve is tested to hold 300 p.s.i. in line pressure and is claimed to operate at an out-of-balance pressure of 150 p.s.i. To ensure reliability, even with the coil submersed in water, the valve coil is layer wound with insulation between each layer of wire and the whole coil unit is completely encapsulated in p.v.c. The valve operates by making use of line pressure to do most of the work of opening and closing the valve. The solenoid only controls a small pilot valve which in turn operates the main valve. The standard valve is supplied for mounting with a coil in the vertical plane but valves can be supplied for mounting in any other position if required. No stuffing boxes, glands or pistons are used which may cause sticky or sluggish operation.

The valve body is of brass and all internal parts are non-corrosive stainless steel. External brackets are heavily plated for corrosion protection. The valve can also be supplied with a built-in flow regulator.

HEATING PANELS

New skirting panels have been added to the range of electric heating appliances manufactured by UNITY HEATING, LTD., Chilworth Manor, Southampton. Two models are available, each measuring 30in in length. One, a ventilated type, is $7\frac{1}{2}$in high and is rated at 120 or 180 W per ft. The other, unventilated, is 5in high and rated at 60 W per ft. Wooden dummy sections are provided for corner mitres and metal dummy sections can be supplied to the nearest $\frac{1}{2}$in.

Tubular heater guards, which can be clipped to any standard 2in diameter tubular heater in one-, two-, three-, or four-way types, have also been introduced. The skirting panels are priced at from £4 10s, including purchase tax, and the guards cost from £1 each, tax free.

TUMBLER CLOTHES DRYER

The new "Tumblair de Luxe" model D.3 tumbler type clothes dryer which is introduced by BURCO, LTD., Rose Grove, Burnley, Lancs., has several new features, including 3-heat control, a final cooling cycle, and a drop-down front door with observation ports. Like its predecessor, model D.2, it tumbles wet clothes in a stream of heated air moved by a fan. Two controls are provided—the left-hand can be set to the maximum loading of 2·5 kW or 1·25 kW, 625 W, or cool air only. The right-hand knob controls a timer—a 120-minute clockwork mechanism graduated in ten-minute intervals. Whatever the preselected drying period, the drum continues to revolve without heat for a further five minutes to allow the metal and clothes to cool down. The opening of the drop-down door actuates a micro-switch which turns off the heat and the motor driving the drum and fan, at the same time illuminating the drum interior.

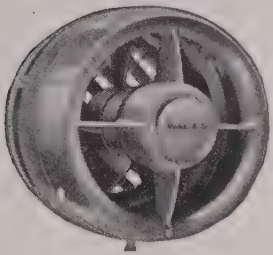
The machine has a clothes drying capacity of $4\frac{1}{2}$ lb to 6 lb and rotates at a speed of 52 to 54 r.p.m. It is driven by a $\frac{1}{8}$ h.p. motor. The cabinet measures 36in high by $21\frac{1}{4}$in wide by 21in deep and is finished in white or cream stoved enamel with blue trim. Its working top is in black and white pattern "Melamine." The standard D.3 model has an exhaust through a lint bag at the front, while another version, model D.3R, has its exhaust at the back and is fitted with a short vent pipe for sliding into another pipe for passing through a wall. Both models are priced at £56 10s 2d, including £9 9s 3d purchase tax.

FOR BETTER AIR CONDITIONS

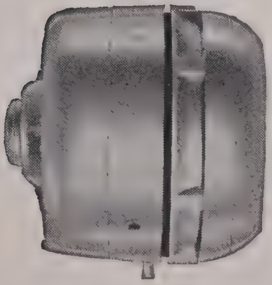
WINDOW MODELS
in black or ivory

6″

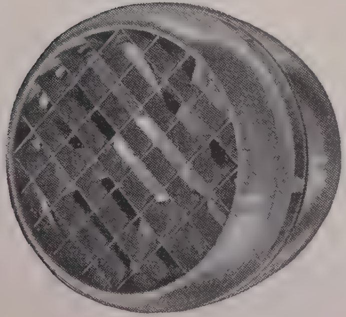
7½″



9″



12″



The Vent-Axia range of elegant window and wall models can be equipped with optional fitments to satisfy a wide variety of ventilation requirements.

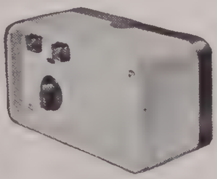
- ✳ Inbuilt automatic shutter to prevent backdraught.
- ✳ Choice of control : Single Direction (Type SD) or Reversible (Type R), both giving three speeds including boost for extra performance.

Here is ventilation, just as you want it, at the turn of a switch.

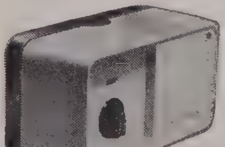
Vent-Axia

60 Rochester Row • London SWI
Telephone: VICtoria 2244
BRANCHES AT GLASGOW · MANCHESTER
BIRMINGHAM · LEEDS
NEWCASTLE-UPON-TYNE · BRISTOL

A MEMBER OF THE HALL-THERMOTANK GROUP



CONTROL SWITCH TYPE R

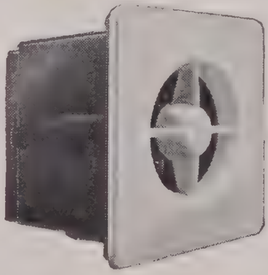


CONTROL SWITCH TYPE SD

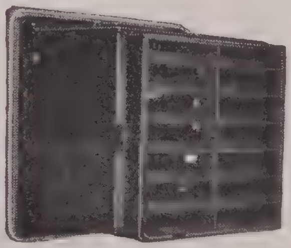
WALL MODELS
with ivory fascia

6″

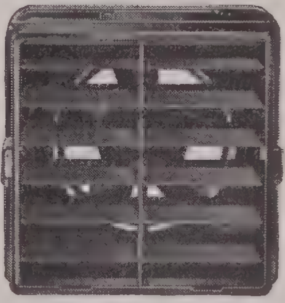
7½″



9″



12″



SPECIFY VENT-AXIA

DOUBLE SECURITY

The Members of the ASSOCIATION OF STEEL CONDUIT MANUFACTURERS are united in their determination to maintain the HIGH AND CONSISTENT QUALITY OF THEIR PRODUCTS.

THE A.S.C.M. MARK

is a guarantee of the fulfilment of this intention and also to the fact that A.S.C.M. Conduit conforms to B.S. Specification 31. A.S.C.M. methods of production and the self-imposed high standards achieved ensure just that

EXTRA SATISFACTION AND SECURITY

by which Architects and Consulting Engineers can make absolutely sure of the reliability of the electrical installations for which they are responsible.

SPECIFY A.S.C.M.
AND ENJOY THIS DOUBLE SECURITY

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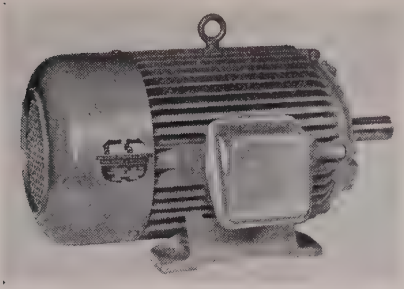
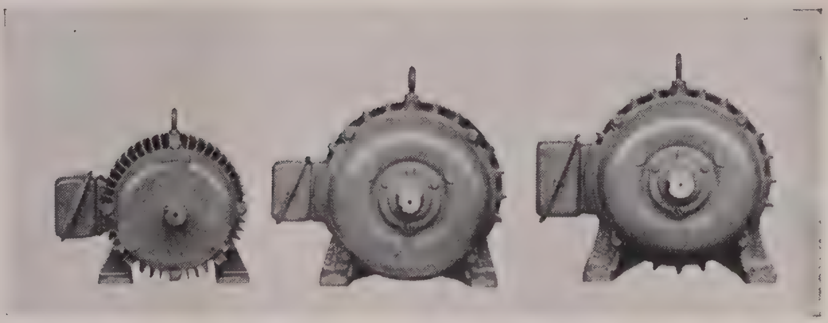
General Electric Co. Ltd.
 Incorporating :
  The Oriental Tube Co. Ltd.
Metallic Seamless Tube Co. Ltd.
Monmore Tubes Ltd.
Simplex Electric Co. Ltd.
 Incorporating :
  Credenda Conduits Co. Ltd.
  Simplex Conduits Ltd.
  Stella Conduit Co. Ltd.
Walsall Conduits Ltd.
Electrical Conduits Ltd.
Hildick & Hildick

Association of Steel Conduit Manufacturers, 96 Hagley Road, Birmingham, 16.

INTERNATIONALLY STANDARD MOTORS



Above : Lancashire Dynamo 10 h.p. Crypto-D motor



Right : The motor shown on the left for comparison with 10 h.p. motors to B.S. 2960, Pt. 2 (centre) and B.S. 2083 (right)

A NEW range of totally enclosed, fan-cooled, cage rotor motors, the Crypto-D (EDL), has been developed by Lancashire Dynamo & Crypto, Ltd., a company in the Metal Industries Group, and is now in production at their works at Acton Lane, Willesden, London, N.W.10.

The motors are dimensionally to the British Standard 2960, Pt. 2, and also comply with American and Continental standards and international recommendations. Outputs considerably in excess of those quoted in B.S. 2960 and equal to or better than those of DIN 42637, however, are obtained. For a given horsepower the new motors are effectively one frame size smaller than those to the British Standard. These higher outputs are available with performance to B.S. 2613, Class E insulation, 65°C temperature rise (40°C maximum ambient temperature), continuous maximum rating. The motors can be either horizontal foot-mounted or flange fixing types. By varying the winding lengths outputs from a given frame size corresponding to any of the currently used standards can be produced.

The range covers motors for operation on three-phase 50 c/s supplies up to 650 V with continuous maximum ratings from 0·5 to 50 h.p. in 14 steps, and of 2, 4, 6 or 8 pole construction with synchronous speeds of 3,000, 1,500, 1,000 and 750 r.p.m. respectively. The prices for the standard units are from £15 14s to £163 13s. Non-standard ratings can be produced if required.

The terminals are of the stud type housed in a terminal box with the cable inlet adjustable through 90°. The terminal box is normally mounted on the left, when viewed from the driving end, but may also be arranged for the opposite hand. Special requirements for protection against weather and corrosive and dust-laden atmospheres can be met and oil seals can be provided for use with gearboxes, etc.

CATALOGUES AND LISTS

CABINETS.—Illustrated catalogue showing typical examples of cabinets produced by the company for electronic equipment.—**Hassett & Harper, Ltd.**, Regent Place, Birmingham.

CONTACT FINGERING.—Leaflet dealing with a range of contact fingering available in a variety of finger lengths, width and pitch for such uses as door bonding in screened rooms and r.f. ovens, connections to the electrodes of coaxial and external anode type valves, etc.—**Sealectro Corporation,** Hersham Factory Estate, Walton-on-Thames, Surrey.

DOMESTIC APPLIANCES.—Catalogue (24 pages) illustrated in colour and covering the range of domestic electrical appliances available from the company.—**Falk, Stadelmann & Co., Ltd.**, 91, Farringdon Road, London, E.C.1.

Catalogue (12 pages) dealing with domestic electrical appliances produced by the company.—**G.E.C. (Domestic Equipment), Ltd.**, Langley House, Hanger Lane, Ealing, London, W.5.

Brochure describing three clothes drying cabinets.—**Aerialite, Ltd.**, Hargreaves Works, Congleton, Cheshire.

FANS.—Catalogue (2605) containing particulars of paddle bladed D fans.—**Sturtevant Engineering Co., Ltd.**, Southern House, Cannon Street, London, E.C.4.

Brochure and price list illustrating and decribing the range of "Vent-Axia" fans.—**Vent-Axia, Ltd.**, 60, Rochester Row, London, S.W.1.

FURNACES.—Descriptive brochure (R.1) on electrode salt bath furnaces.—**Efco Furnaces, Ltd.**, Queens Road, Weybridge, Surrey.

LAMPS.—Catalogue (AR.161) covering the company's range of tungsten and fluorescent lamps and lighting equipment.—**Luxram Electric, Ltd.**, 72, Great Eastern Street, London, E.C.2.

LIFTING MAGNETS. — Brochure (P.1008) containing technical details and illustrations of electric lifting magnets and associated control gear.—**General Electric Co., Ltd.**, Witton, Birmingham, 6.

Pamphlet on "Dreadnought" lifting magnets and controllers.—**Rapid Magnetic, Ltd.**, Lombard Street, Birmingham, 12.

LIGHTING FITTINGS.—Leaflets illustrating "Fildenex" unbreakable polyethylene lampshades and "Resincast" fluorescent lamp control gear.—**H. W. Field & Son, Ltd.**, Station Road, Harold Wood, Essex.

Catalogue of opal glass type fittings for use with g.l.s. lamps.—**A.E.I. Lamp & Lighting Co., Ltd.,** Melton Road, Leicester.

Illustrated leaflet on the "Louvrelens" flush ceiling mounting optical system for high-lighting effects.—**Holophane, Ltd.**, Elverton Street, London, S.W.1.

MAGNETIC SEPARATORS.—Illustrated brochure dealing with magnetic separators designed for extracting tramp iron or any form of magnetic material from various substances. —**General Electric Co., Ltd.**, Witton-Kramer Division, Birmingham, 6.

MOTORS.—Leaflet (SL.1) containing particulars and dimensions of totally enclosed, fan cooled, cage rotor motors.—**Lancashire Dynamo & Crypto, Ltd.**, Trafford Park, Manchester, 17.

Booklet (617) illustrating and describing geared motor units and reduction gears.—**Crofts (Engineers), Ltd.**, Bradford, 3, Yorks.

PHOTO-ELECTRIC EQUIPMENT. — Brochure dealing with photo-electronic smoke alarm, smoke density indicator and recorders. —**Photoelectronics (M.O.M.), Ltd.**, Oldfields Road, Sutton, Surrey.

Pamphlet giving information on the "Cub" photo-electric timers.—**Hird-Brown, Ltd.**, 244, Marsland Road, Sale, Cheshire.

Descriptive brochure on a transistorised photo-electric relay for industrial control operations.—**Radiovisor Parent, Ltd.**, High Path, London, S.W.19.

SACRIFICIAL ANODES.—Leaflet giving information on "Sturtepak" sacrificial anodes for cathodic protection.—**Sturtevant Engineering Co., Ltd.**, Southern House, Cannon Street, London, E.C.4.

SPACE HEATING.—Leaflet illustrating and describing a range of thermal storage space heaters.—**Heatstore, Ltd.**, Brackley, Northants.

Illustrated leaflet on "Voleata" embedded cables for floor warming and ceiling or wall heating, together with a copy of a booklet on installation.—**Volex Electrical Products, Ltd.**, Salford, 6.

Financial Section

STOCKS and SHARES

STOCK EXCHANGE markets continue to be held in a state of suspended animation as matters move towards a more decisive stage both on the home front and in the field of international politics. With War Loan fairly steady on a 6¾ per cent yield basis, and most of the popular "growth" industrials offering 2 to 3 per cent less, the relationship between the two markets seems to have become fairly well stabilised, for the time being, at a level which gives trustees little inducement for exercising their new investment freedom, and which led Sir Edward Wilshaw to discuss, at the annual meeting of Globe Telegraph & Trust, the advisability of placing a larger proportion of the company's funds in dated Government stocks.

Dull Markets

Electrical shares followed the general tendency of prices to drift downwards, but few changes were of any great consequence. Among the week's company news items was the announcement by Eleco of increased profits and the equivalent of a doubled dividend, but this proved to have been discounted, for the shares remained unaltered at 8s. International Combustion dropped further to 25s 6d, although in maintaining the interim dividend the directors reaffirmed their earlier forecast that it should be possible to keep the total at 30 per cent despite their expectation of lower profits. Philips' Lamps fell to £10, their lowest of the year, as a result of some disappointment over the half-yearly report. Efco's annual report made a good impression and the 10s shares were steady at around 31s.

Dimplex Activity

There have been some very lively movements in the price of Dimplex 5s shares. A month ago they were depressed down to 67s 6d after the announcement of the Chancellor's new measures and his appeal for dividend restraint, but having recovered steadily to around 76s, they jumped to 83s 9d in the course of a single day, later reacting to 77s 6d. This, incidentally, is equivalent to some five times the price at which the shares were publicly offered for sale less than two years ago. American buying was among the factors conjectured to be responsible for recent activity. The final dividend and result for the year ended last June are due within a few weeks.

Electric Construction Prospects

At the annual meeting of the Electric Construction Co. shareholders were told that a large order book, coupled with strenuous efforts to increase output and a growing contribution from new products, encouraged an optimistic outlook, although competition remained very severe. Among the factors responsible for the setback in 1959–60, the chairman mentioned restriction of home

Price Changes in

Company or Board	Nom. Value	Middle price 28th Aug.	Week's Rise or Fall	Dividend		Yield %	1961	
				Previous	Last		Highest	Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	70½x.d.		3	3	4 5 0	75½	70½
Brit. Elec. 1974/77	100	65½		3	3	4 11 6	70½	64½
Brit. Elec. 1976/79	100	68		3½	3½	5 3 0	73½	67
Brit. Elec. 1974/79	100	75x.d.		4¼	4¼	5 13 3	82	75
Brit. Elec. 1967/69	100	86½		4½	4½	5 4 0	91½	86
Overseas Electric Supply								
Calcutta Elec.	£1	21/-		7†	7½†	11 12 0	23/3	20/6
East African Power	£1	13/6	+3d	8	10	14 16 6	15/-	13/-
Nigerian Elec.	£1	18/6		8	10	11 2 0	19/9	15/6
Perak Hydro-Elec.	£1	21/3		10	10	9 8 3	23/6	17/6
Electrical Shares								
Aberdare Holdings	5/-	15/-		17½	17½	5 16 9	17/-	14/3
Aerialite	1/-	4/9		54	54	11 7 0	8/-	4/6
Allen, W. H.	£1	30/-		14	10*	6 13 3	42/6	30/-
Allied Insulators	5/-	8/-	−3d	20	10*	6 5 0	10/-	8/-
Alwyn Holdings	5/-	19/-		12½	15‡*	3 19 0	22/3	16/6
Anglo-Portuguese Tel.	£1	20/-	+9d	9	9	9 0 0	25/-	18/9
Arcolectric	1/-	5/-	−3d	15	15	3 0 0	6/-	3/9
Aron Meters	5/-	20/-	+1/-	15	15	3 15 0	20/-	17/-
Assoc. Elec. Ind. Ord.	£1	35/-	−3d	15	15	8 11 6	48/6	35/-
Automatic Tel. & El.	5/-	16/3	+3d	17	17	—	20/6	12/9
Babcock & Wilcox	£1	26/6	+6d	9	9	6 15 9	36/6	25/6
Bakelite	10/-	45/-	+1/3	17½	17½*	3 17 9	60/-	42/-
Baldwin, H. J.	2/-	1/3		10	Nil	—	1/9	1/3
Berry's Electric	5/-	51/-	+6d	30	33⅓*	3 4 3	52/6	37/-
Bowthorpe Holdings	2/-	7/9		18½	22	5 13 6	10/3	7/9
Brit. Elec. Resistance	2/-	7/-		17½	17½*‡	5 0 0	8/9	6/6
Brit. Elec. Traction:								
Def. Ord. "A"	5/-	48/6	−6d	40	50	5 4 3	57/6	41/9
Brit. Electronic Ind.	5/-	10/-		—	15‡	7 10 0	15/3	9/9
B.I. Callender's	£1	57/9	−6d	13½	13½	4 13 6	62/3	49/6
B.I. Callender's 6% Pref. ...	£1	16/6		6	6	7 5 6	18/3	16/6
British Thermostat	5/-	30/-		20	27½	4 11 9	40/-	28/-
Brook Motors	10/-	53/-	−1/6	25	25*	4 14 3	55/-	47/-
Bulgin, A. F.	1/-	11/3		55	40*	3 11 0	12/3	7/9
Bulpitts	5/-	17/9		15	16½	4 11 6	27/6	16/9
Burco Dean	5/-	6/3		18	15	12 0 0	11/9	6/3
Cable & Wireless	5/-	17/-	−6d	10	10*‡	2 18 9	19/9	12/6
Cambridge Instruments ...	5/-	32/-		12½†	22	3 8 9	38/6	30/-
Chloride El. Storage "A" ...	£1	80/9	−1/9	17½	20	4 19 0	91/-	72/-
Clarke Chapman	£1	37/6	−1/3	13¾	13¾	7 6 9	54/-	37/6
Clarke, T.	2/-	4/-		16	16	5 6 9*	5/3	3/6
Combined Elec. Mfrs.	4/-	6/9		—	12½	7 8 3	10/-	6/9
Contactor Switchgear	5/-	12/9		14	14	5 9 9	16/-	12/9
Cossor, A. C.	5/-	7/3		Nil	Nil	—	8/-	5/6
Crabtree	10/-	24/6		20	12½*	5 2 0	33/9	24/6
Crompton Parkinson	5/-	12/-		14	12½*	5 4 3	14/6	11/3
De La Rue	10/-	51/6	−1/6	22½	22½*	4 7 6	70/-	51/6
Decca "A"	10/-	61/6	−1/-	20	23⅓	3 16 0	70/-	52/3
Desoutter	5/-	55/-	−2/6	30	35	3 3 9	68/9	49/-
Dewhurst	2/-	4/9	−3d	20	20	4 4 3*	6/6	3/9
Dictograph Tel.	2/-	9/9	−9d	20	20*	4 2 0	13/-	8/6
Dimplex	5/-	77/6	+1/3	—	30	1 12 3*	83/9	47/-
Dubilier Condenser	1/-	2/-		30	15*	7 10 0	3/-	2/-
Duport	5/-	11/-	−6d	17½	20	6 1 3*	17/-	11/-
E.M.I.	10/-	37/3	−6d	20	17½*	4 14 0	51/3	36/9
Eleco	2/-	8/-		20	20*‡	5 0 0	10/6	4/3
Electrical Apparatus	5/-	18/6		14½	20	5 8 0	21/-	17/-
Electrical Components	5/-	7/9		11½	12½	8 1 3	9/9	7/9
Elec. Construction	£1	20/9	−6d	9	5	4 16 6	39/-	20/9
Elliott-Automation	5/-	35/-		9·3	13	1 17 3	37/6	25/6
Enfield Rolling Mills	£1	40/-		15	15	7 10 0	51/6	40/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

sales demand and a shortage of skilled labour, as a result of which production failed to reach the level necessary to offset falling profit margins and to keep pace with a growing order book. Profits contracted consequently from £108,000 to £33,000, after tax, and the dividend was reduced from 9 to 5 per cent. The £1 shares have declined nearly to their par value.

B.S.R.

In declaring an interim dividend of 10 per cent on account of the year ending in September, the directors of Birmingham Sound Reproducers announce that the plan to add refrigerators to the company's range of products has been suspended. Taking into account the pressing need for exports, and the state of trade in refrigerators, they think their efforts can be used to better advantage elsewhere. Meanwhile, production in the fields of gramophones and tape recorders is said to be continuing at a high level, and considerable optimism is expressed about both short- and long-term prospects. The decision to keep this year's interim payment at the same rate, in effect, as before, conforms with the Chancellor's wishes on the subject. The price of the 5s shares moved up to 36s 3d following these announcements.

Electrical Investments

Company or Board	Nom. Value	Middle price 28th Aug.	Week's Rise or Fall	Dividend		Yield %	1961	
				Previous	Last		Highest	Lowest
Electrical Shares—continued						£ s d		
English Electric	£1	29/9		10	10	6 11 3	40/9	29/9
English Electric 3¾% Pref.	£1	10/-		3¾	3¾	7 10 0	11/9	10/-
Ericsson	5/-	27/9		13†	13†	—	32/-	22/3
Ever Ready	5/-	36/9	−9d	30	22½	3 1 3	40/-	31/6
Falk Stadelmann	£1	22/6		10	7½	6 13 3	26/-	21/9
G.E.C.	£1	28/9	−6d	10	10	6 19 3	39/6	28/9
G.E.C. 6½% Pref.	£1	16/6		6½	6½	7 17 6	19/3	16/6
General Cables	5/-	5/3		15	Nil	—	6/3	5/9
G.H.P. Group	£1	21/6	−6d	6	7‡	6 10 3	24/6	17/-
Goblin (B.V.C.)	5/-	4/6		12½	10	11 2 0	8/6	4/3
Hackbridge Holdings	5/-	5/-		20	20	10 0 0*	6/9	5/-
Harland Engineering	5/-	13/3		16	16	6 0 9	19/-	13/3
Head Wrightson	5/-	23/6		14	16	3 8 0	30/-	22/-
Heatrae	2/-	14/-		12½	25	3 11 6	19/-	12/6
Holophane	5/-	16/-	−6d	26	30	9 7 6	20/6	16/-
Hoover	5/-	40/-		90	45*	5 12 6	55/6	37/6
Hunt, A. H.	4/-	18/9	−9d	20	20	4 5 3	25/9	18/-
Intl. Combustion	5/-	25/6	−2/-	30	30	5 17 9	33/9	24/-
Intl. Computers & T.	£1	92/6		10	11¼	2 8 9	107/-	59/-
Johnson & Phillips	£1	21/-		Nil	5	4 15 3	24/-	17/6
Kenwood Mfg.	1/-	4/-	−3d	—	—	—	6/-	4/-
Laurence Scott	5/-	14/3		15	15	5 5 3	19/8	14/3
Lister, R. A.	£1	50/6	+6d	14	14	5 11 0	56/9	45/6
Lucas, J.	£1	53/-	−1/9	12½	13¾	5 3 9	71/6	53/6
Marryat & Scott	2/-	16/9		27½	32½	3 17 6	18/6	13/9
Mather & Platt	£1	38/-		11	11	5 15 9	51/6	38/-
Metal Industries	£1	55/-	−6d	15	15	5 9 0	66/6	50/-
Midland Elec. Mfg.	£1	60/-	−1/3	12	12	4 0 0	67/6	58/6
Murex	£1	41/3	−1/3	20	13*	6 6 3	51/6	39/3
Newman Ind.	2/-	7/-	−3d	12½	15	4 5 9	7/6	5/-
Oldham & Son	1/-	2/9		17½	17½*	6 7 3	3/-	2/3
Parsons, C. A.	£1	52/6	−2/-	9⅜	12½	4 15 3	72/6	46/9
Philips' Lamps	Fl.10	200/-	−5/-	16	16*	1 12 0	£13½	£9⅝
Plessey	10/-	49/3	−9d	17	15*‡	4 1 3*	60/-	46/6
Pullin Group	2/-	11/6		25	25	4 7 0	15/-	11/3
Pyrotenax	5/-	55/-		40	45	4 1 9	65/-	46/6
Radiation	£1	25/-		12	10	8 0 0	37/6	25/-
Reliance-Clifton	5/-	28/6		15	20	3 10 3	32/6	22/6
Reyrolle	£1	42/-	−9d	17½	9¾*	4 12 9	51/6	36/6
Richardsons Westgarth	10/-	4/6	−3d	8½	Nil	—	8/3	4/9
Sangamo Weston	10/-	19/6		12½	13½	5 2 6*	25/9	19/6
Scott, James	5/-	30/-		25	27½	4 11 9	32/-	25/6
Simon Engineering	5/-	36/3		—	27½	3 15 9	43/9	28/-
Smith (England), S.	4/-	15/3	−3d	17½	20	5 5 0	23/9	14/6
Southern Areas	£1	16/6		5	6	7 5 6	23/-	14/6
Strand Elec.	5/-	18/-	−3d	14·6	20‡	5 11 0	20/-	12/3
Sturtevant	5/-	11/-		15†	13†	9 14 0	18/6	11/-
Sun Elec.	5/-	15/6		15	18½	5 19 0	17/6	15/6
T.C.C.	10/-	42/-		35	22½*	5 7 3	43/9	40/-
Telephone Rentals	5/-	23/9	−3d	15	15‡*	3 3 3	29/6	18/6
Thompson (John)	5/-	13/9	−6d	20	5	—	16/9	14/-
Thorn Elec.	5/-	51/3	+9d	25	25	2 8 9	63/-	44/6
Thornycroft	4/-	5/6		6	6	—	7/-	5/6
Tube Investments	£1	62/6		—	14	4 9 6	85/-	62/6
Ultra Electric	5/-	25/-		20	25	—	31/3	12/6
Walsall Conduits	4/-	11/-		15	15	5 9 0	15/-	10/9
Ward & Goldstone	5/-	28/9	−3d	35	17½*	3 0 9	36/6	25/6
Watford	2/-	7/-		25	20*	5 14 3	10/9	7/-
Westinghouse	£1	33/9		11	11	6 10 3	45/-	33/3
West, Allen	5/-	11/-		12½	13½	6 2 6	14/6	10/3
Wilkins & Mitchell	5/-	8/9		21	12	6 17 3	15/3	8/9
Wolf Electric	5/-	13/6		12½	13¾	5 1 9	17/6	13/6

Nuclear Investment Issue

Markets are in no condition to welcome new capital issues these days. Among the largest of them in recent weeks, the Colvilles "rights" offer went to the underwriters to the extent of over 80 per cent, and there was a similar outcome to the issue of 845,000 new 5s shares at 8s 6d each by Nuclear Investment. According to a statement from this company, however, the underwriters have placed the shares, at the issue price, with private investors wishing to acquire them for long-term investment purposes. For the current year the board anticipates an interim payment of 2½ per cent on the old capital and a final of 3 per cent on capital doubled by the new issue. On a total of 5½ per cent the yield on the shares at 8s 6d would be 3¼ per cent. The new money has been raised in the belief that the recession in market prices has created favourable opportunities for extending the company's specialised interests in the nuclear, electronics and automation fields.

Colvern Progress

Record results were achieved by Colvern in the year ended last March, and the chairman told shareholders at the recent annual meeting that sales were being maintained at a satisfactory level in the current year. There was an extensive order book, more working space had been acquired and, barring unforeseen events, he saw no reason why the company should not continue to share in the growth which he regarded as ensured in the electronics industry. For 1960–61 the dividends totalled the equivalent of approximately 34½ per cent on the present capital of £322,000. The 5s shares fell by about 3s during the week to 46s 6d, but the yield of a fraction under 3¾ per cent shows that they are given a high investment rating.

REPORTS and DIVIDENDS

Efco Expansion Prospects.—In his annual review Mr. D. F. Campbell, chairman of Efco, Ltd., says that the last five months, since the year-end at 31st March, indicate little variation in the value of orders received and, with three recently formed associated companies approaching a profitable basis, the prospect of further expansion of the company is promising.

The furnace group had a large volume of unfilled orders at the end of the financial year and the order intake since then has been "quite satisfactory."

Reporting on Birlec-Efco (Melting), Ltd., formed 2½ years ago in partnership with A.E.I., Mr. Campbell says its present order book extends to several million pounds. This year it is expected that all preliminary expenses will be written off and a modest profit made, with excellent prospects for subsequent years.

B.S.R. Drop Refrigerator Plan.—Birmingham Sound Reproducers, Ltd., announce an unchanged interim dividend of 10 per cent "to conform to the wishes of the Government."

The board has also decided to suspend the company's refrigerator project "in view of the pressing need to increase our exports and bearing in mind the large stocks of refrigerators both in England and Europe." It is thought that their efforts would be more beneficial in other directions. In the meantime the company are fully occupied in the gramophone and tape recorder fields and production continues at a high level and the board looks forward to the immediate and more distant future with considerable optimism.

Eleco, Ltd., formerly the Engineering & Lighting Equipment Co., Ltd., recommends a final dividend of 13¾ per cent to make the equivalent of 25 per cent for the 15 months to 30th June, 1961. This equals 20 per cent per annum and compares with the previous year's equivalent of 10 per cent.

Group profits, including 15 months' trading of parent and two years' of subsidiary acquired in July, 1959, amounted to £328,564, against £136,111 for the previous year. After tax, the net balance of £131,228 compares with £70,859.

Philips' Lamps.—In the first half of this year the sales of Philips' Incandescent Lamp Works (Eindhoven) rose by 3 per cent. This is lower than the increase forecast in the annual report due, it is stated, to the fall in TV sales in Germany, Sweden, Norway, Australia and Britain. Nevertheless, the board "has no grounds for modifying the annual report's forecast that 1961 sales will exceed Fl.5,000 million (£500 million)," which implies some recovery in the second half of the year. Capital expenditure this year is expected to increase by 25-30 per cent on last year to Fl.500 million. Last year investment was up by 50 per cent.

Hackbridge Holdings, Ltd.—The trading profit for the year to 31st March was higher at £299,969, compared with £276,777 for the previous year. After depreciation of £123,452 (£116,141) and tax of £115,667 (£102,623) the net profit is £60,850 against £58,013. A final dividend of 7½ per cent makes a total for the year of 10 per cent, which is effectively the same as before after allowing for the scrip issue of one-for-one.

The directors state that, in company with other organisations in the electrical industry, the company has traded under increasingly difficult circumstances and, under such competitive conditions, the results are not unreasonable. An encouraging order book prompts the board to look forward to satisfactory results in the current year.

Kango Electric Hammers, Ltd.—Interim dividend 7½ per cent. In the first six months of 1961 sales were nearly 20 per cent above those for the corresponding period of 1960, and nearly 12 per cent above the high level achieved in the last half of 1960, the directors state.

George H. Scholes Scrip Issue.—The net profit for the year to 30th June is £215,483 compared with £202,042 for the previous year, after tax of £234,013 (£190,061). A final dividend of 22½ per cent makes an unchanged total for the year of 27½ per cent. It is proposed to make a scrip issue of one-for-five.

A. C. Cossor Loss.—With the formal offer for the capital of A. C. Cossor, Ltd., from the Raytheon Company of the U.S. is the statement that Cossor incurred a group loss, before tax, of £443,285 in the year ended 31st March last.

Levels of production and sales, it is stated, have since then been rising satisfactorily, order books are in a healthy position and there is every reason to hope that the current year's group results will show a small profit. It is pointed out, however, that with the heavy debit balance occasioned by last year's loss, a number of years must pass before that balance can be cleared off and dividends resumed.

The directors are accepting the offer in respect of their own holdings and recommend all holders to do likewise.

International Combustion (Holdings), Ltd.—Interim dividend 10 per cent. Present indications are that, as already intimated, the profit for the year 1960-61 will be lower than for the previous year but the board still anticipates being able to recommend payment of the same total rate of dividend on the ordinary stock as last year.

Crystalate (Holdings), Ltd., is raising its dividend by 2½ per cent to 15 per cent for the year to 31st March, 1961. Group profit of £120,911 compares with £119,686 previously. After deducting tax, the net balance is down to £55,645, from £65,527.

Heatrae Expansion.—Heatrae, Ltd., has successfully completed an £86,100 deal for the take-over of the Glasgow electrical heating equipment firm of Duncan Low, Ltd.

Liquidations

Winding-up proceedings or liquidations are often undertaken for the purpose of reconstruction, the transfer of a business, or other reasons. The appearance of a company's name under this heading therefore does not necessarily indicate insolvency.

F. E. White (Electrical), Ltd., radio, television and electrical engineers, 29, Friar Lane, Leicester.—Winding up voluntarily. Liquidator, Mr. R. A. Haigh, Court Chambers, Friar Lane, Leicester, appointed by members and creditors on 11th August. Particulars of claims to the liquidator by 28th September.

P.L.D. (Electrical), Ltd., dealers in domestic appliances, 261, Kingsway, Burnage, Manchester, 19.—Winding up voluntarily. Liquidator, Mr. A. T. Eaves, 47, Mosley Street, Manchester, 2, appointed by members and creditors on 17th August. Particulars of claims to the liquidator by 30th September.

W. R. S. Horne, Ltd., 86, Regent Street, Leamington Spa, radio, television and electrical engineers.—Liquidator, Mr. R. F. Bendall, 126, Colmore Row, Birmingham, 3, released 7th July.

Bransom Kent, Ltd., electrical wholesalers, 5, Morewell Street, London, W.C.1.—Liquidator, Mr. L. H. Cohen, 18, Harcourt House, 19, Cavendish Square, London, W.1, appointed by members on 4th August.

Bankruptcies

Constance Ruby Brown, lately carrying on business in partnership with another as wholesalers of electrical appliances, under the style of Brown Wholesale Electrics, from 11, Churchill Walk, Hackney, London, E.9.—Order for discharge made 13th July, suspended for one day.

H. H. Blackwood, trading as H. H. Blackwood & Co., lately carrying on business at 231, Canterbury Street, Gillingham, Kent, electrical goods retailer.—Receiving order made 16th August on a creditor's petition.

G. Dickinson and **K. G. Dickinson,** carrying on business in partnership as G. & K. G. Dickinson at 134, Clipsley Lane and 321, Church Road, Haydock, Lancs., electricians. (Separate application of K. G. Dickinson.).—Order for discharge made 28th July suspended for three months.

NOW BERRY'S INTRODUCE MAGIFLOW

The new one-gallon water heater

HERE IS MAGIFLOW—the latest newcomer to Berry's famous 'Magi' range of electrical appliances.

Trim good looks and top efficiency make the Magiflow the water heater more and more people are going to ask for. Its sleek design takes up less than a square foot of wall space—yet Magiflow can supply more than enough piping hot water for any average family, thanks to its exceptionally quick recovery.

First-class insulation and "magic eye" thermostatic control cut running costs to the absolute minimum. Check all the Magiflow's features and see why *this* is the water heater you should recommend.

Capacity:	1 gallon
Voltage:	200-250V
Loading:	2kW at 250V 1·5kW at 200V
Size:	17" high 7½" wide 8" projection
Finish:	White or cream Chromium fittings Black, easy-to-clean, toughened plastic tap

£10.16.6 plus P.T. £2.6.5

PRICE: £13.2.11

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A specialist team of insulation and chemical engineers is available for consultation.

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RC.I

U.K. Electrical Trade in July

EXPORTS from the United Kingdom of electrical machinery and appliances, which in the year 1960 showed very little increase over 1959, were in the three months May-July 20 per cent more than a year earlier. There were increases of 30 per cent in radio and television apparatus and valves, 29 per cent in transformers and switchgear, 13 per cent in telegraph and telephone equipment, 12 per cent in wires and cables and 10 per cent in generators and motors.

In July the value of electrical exports was £22·4 million (compared with £18·2 million in July, 1960, and £22·7 million in June, 1961), thus bringing the total for the year up to £157·5 million (compared with £138 million a year earlier). With the exception of wires and cables, the seven months' total for each of the main product groups was better than a year earlier. There were marked improvements also in exports of heating appliances and parts, desk fans, vacuum cleaners, food mixers, dry shavers and power tools. Wiring accessories, industrial electronic control apparatus, scientific instruments, washing machines incor-

TABLE I.—ELECTRICAL EXPORTS

Class	Month of July 1961	Seven months ended July 1960	Seven months ended July 1961
	£	£	£
Generating sets:			
Diesel driven not exceeding 10 kW ...	106,336	912,565	784,189
10 kW to 65 kW	185,097	1,010,295	990,410
65 kW to 200 kW	127,323	802,152	718,845
Over 200 kW	379,360	1,106,022	2,188,973
Driven by steam turbines	71,078	563,573	220,282
Driven by spark ignition engines, hydraulic turbines or other prime movers ...	62,450	227,293	704,119
Generators:			
Not exceeding 200 kW	154,642	616,979	951,315
Over 200 kW	64,276	822,851	453,439
Parts	735,066	5,556,388	3,757,364
Motors, complete, other than railway, tramway and trolley-bus:			
Not exceeding ½ h.p.	177,151	1,649,463	1,512,484
Exceeding ½ h.p. but under 1 h.p. ...	85,024	483,246	671,886
From 1 to 250 h.p.	513,325	3,284,734	3,604,206
Exceeding 250 h.p.	98,071	1,296,928	1,137,980
Railway, tramway and trolley-bus motors, complete, and parts of all motors ...	173,925	1,276,835	1,610,093
Starting and controlling gear for electric motors	354,523	1,876,318	2,612,430
	3,287,647	21,485,642	21,918,015
Converting machinery	22,526	400,356	663,823
Mercury-arc rectifiers	35,052	344,298	364,553
Transformers for lighting, heating and power (incl. coils):			
Not exceeding 7,500 kVA	459,400	3,305,923	2,910,631
Over 7,500 kVA	262,227	1,851,293	2,919,323
Switchgear and switchboards (excl. telegraph and telephone):			
Switchgear up to 200 A and not exceeding 660 V	488,999	2,769,540	3,845,124
Other	1,131,950	7,858,318	8,451,844
	2,400,154	16,529,728	19,155,298
Batteries and/or cells, primary:			
For all lighting purposes	142,470	752,821	964,818
For radio	319,410	2,718,411	2,820,465
Other	51,977	288,419	348,943
Parts (excl. carbons)	68,087	383,490	486,378
Filament lamps exceeding 28 V	134,349	692,787	787,236
Not exceeding 28 V...	30,900	201,702	243,229
Fluorescent tubular lamps	88,068	477,404	639,241
All other lamps	39,071	212,150	263,495
Parts (excl. glass bulbs and carbons) ...	67,209	332,311	531,451
Radio and television, etc., apparatus:			
Thyratrons, hot cathode mercury vapour and gasfilled rectifiers (excl. mercury-arc rectifiers), photo-electric cells (excl. photo-transistors), stabilising and cold cathode valves, magnetrons, klystrons ...	99,326	369,061	528,075
Cathode ray tubes	53,880	380,481	834,817
All other	533,980	2,773,521	4,211,068
Parts (excl. glass bulbs)	37,721	364,931	503,694
Broadcasting and television transmitters...	108,187	410,070	523,513
Communication and navigational and radar equipment	2,278,254	10,413,427	13,101,782
Domestic receiving sets, mains	50,094	489,043	388,885
Battery (incl. complete vibrator sets) ...	113,678	562,147	698,879
Other (incl. mains/battery and radio for cars)	29,736	244,682	232,582
Radiograms	21,819	202,906	206,094
Television receiving sets	51,021	442,641	712,801
Public address equipment	108,375	686,513	664,199
Other radio and television apparatus, n.e.s.	370,299	788,370	1,562,068
Components and parts, n.e.s.	1,310,290	7,831,523	9,073,266
	5,166,660	25,959,316	33,241,723
Telegraph and telephone installations ...	483,481	4,347,811	3,209,126
Telephone instruments	157,719	1,160,519	1,393,281
Parts	902,748	4,848,819	6,135,576
Line app. for long distance communication	311,316	1,659,916	1,952,026
	1,855,264	12,017,065	12,690,009
Cookers	36,401	297,648	299,462
All other cooking appliances	39,495	392,274	400,269
Parts and accessories	87,214	599,624	580,615
Space heating appliances	16,090	156,192	162,632
Water heating appliances	37,017	199,317	277,344
Other heating appliances	35,898	188,635	326,256
Parts and accessories	131,340	608,576	812,152
Irons	62,805	501,191	514,833
Arc welding equipment, a.c.	34,637	318,112	382,727
D.c.	40,363	398,528	319,590
Resistance welding equipment	37,022	279,256	383,370
Electric furnace plant	144,194	679,298	744,251
Sparking plugs	215,357	1,537,092	1,454,193
Electrical appliances for aircraft	302,307	2,041,688	2,129,220
For motor vehicles	576,071	4,310,860	4,669,457
For cycles	34,745	352,658	259,096
Signalling apparatus (incl. traffic signals) ...	300,746	827,159	1,217,243
Instruments, commercial	181,211	1,387,579	1,373,293
House service meters (electrical) incl. parts	113,806	1,110,810	1,147,827
Electro-medical apparatus (excl. deaf-aids, X-ray apparatus and batteries)	42,345	281,986	256,170
X-ray apparatus (excl. tubes and valves) ...	60,944	344,197	504,887
Ceiling fans	51,346	602,074	774,909
Desk fans and parts of desk and ceiling fans	53,899	174,037	274,912
Vacuum cleaners	217,129	1,132,801	1,636,157
Floor polishers	70,248	467,688	416,506
Food mixers	102,463	390,222	590,591
Hair clippers and dry shavers	116,589	649,730	838,876
Other portable appliances	62,290	231,063	451,726
Parts	176,277	1,243,479	1,323,652
Portable elec. tools, incl. parts	269,264	1,733,170	2,147,717
Telegraph and telephone cables and wires:			
Submarine	2,738	1,404,469	125,616
Other	414,754	2,665,858	2,734,036
Other descriptions:			
Cotton, silk or man-made fibres insulated	43,305	166,119	250,188
Enamel, glass or asbestos insulated ...	150,576	742,271	1,042,871
Paper insulated	419,146	4,014,705	3,630,800
Rubber insulated	275,027	1,832,470	2,057,293
Thermoplastic insulated	335,580	2,197,472	2,500,180
Other	179,212	1,401,786	1,560,141
	1,820,338	14,425,150	13,901,125
Accumulators for motor vehicles	130,475	907,924	1,076,452
For radio, and other portable	41,700	253,929	266,609
All other accumulators	58,948	298,306	514,827
Parts and accessories	96,493	589,880	825,675
Electric wiring accessories	243,200	1,498,087	1,735,222
Electrical ware (incl. insulators) of ceramic materials, n.e.s.	153,090	820,513	951,333
Industrial electronic control equipment ...	146,393	1,126,807	1,302,198
Insulators and insulating materials, n.e.s.:			
Cloth and tape	63,557	490,020	453,757
All other	148,037	922,574	969,530
Permanent magnets	70,501	443,590	490,388
Radio, telegraph and telephone testing equipment, n.e.s.	191,698	1,047,506	1,048,859
Scientific electrical instruments (excl. telegraphic and telephonic; time recorders and time switches)	605,151	2,923,448	4,525,362
All electric machinery, apparatus and appliances, n.e.s.:			
Machinery	41,031	290,398	419,742
Other	1,281,282	6,545,275	8,258,401
TOTAL	22,392,723	138,071,597	157,499,714

TABLE 2.—DISTRIBUTION OF EXPORTS (TABLE 1)

Country	Month of July	Seven months ended July	
	1961	1960	1961
	£	£	£
Gibraltar	21,378	126,872	251,408
Malta	40,505	316,765	400,680
Cyprus	89,940	469,800	558,065
Sierra Leone	44,620	247,455	418,481
Ghana	426,897	1,778,238	2,365,207
Nigeria	375,329	3,448,950	3,097,769
Union of South Africa	1,452,970	9,606,621	11,029,104
Rhodesia and Nyasaland	564,940	4,511,262	4,672,168
Tanganyika	44,096	349,252	361,716
Kenya	160,978	1,294,992	1,135,078
Uganda	46,034	212,344	394,101
Mauritius	34,058	495,220	263,640
Aden	93,251	401,449	579,651
Bahrain, Qatar and Trucial States	152,055	769,661	1,075,632
Kuwait	204,634	1,469,914	1,924,053
India	1,391,556	9,197,525	8,154,847
Pakistan	332,988	2,327,517	2,273,745
Singapore	178,583	1,488,309	1,644,802
Federation of Malaya	375,812	1,424,490	2,153,547
Ceylon	178,285	1,210,518	1,275,825
British North Borneo	16,388	148,382	169,372
Sarawak	10,972	116,966	74,626
Hong Kong	541,673	2,770,609	3,464,396
Australia	1,280,514	12,492,718	12,743,140
New Zealand	1,209,557	5,622,657	7,930,933
Fiji	12,062	145,611	206,026
Canada	983,188	8,323,744	7,808,936
Bermuda	41,847	265,314	376,648
Bahamas	35,176	364,954	280,804
Jamaica	135,294	1,105,292	1,244,691
Barbados	20,553	284,283	252,095
Trinidad	169,760	1,114,886	1,021,325
British Guiana	36,794	462,698	358,119
Other Commonwealth countries	88,700	653,317	741,207
Irish Republic	538,419	2,775,428	3,696,832
Soviet Union	174,235	890,784	1,785,251
Finland	131,726	1,230,512	1,269,194
Sweden	483,025	3,604,109	3,937,645
Norway	338,077	1,758,907	2,330,906
Denmark	443,918	1,843,240	2,422,969
Poland	280,453	632,799	1,069,173
Western Germany	730,798	3,467,754	5,082,015
Netherlands	879,412	4,121,500	6,407,065
Belgium	333,491	2,002,686	2,220,705
France	488,109	2,330,561	3,796,838
Switzerland	223,654	1,006,411	1,522,137
Portugal	270,277	1,464,621	1,268,429
Spain	190,539	1,441,854	1,564,898
Italy	510,141	2,679,371	3,937,504
Austria	84,649	530,035	666,018
Yugoslavia	80,200	756,474	736,601
Greece	634,033	667,119	1,314,230
Turkey	499,513	595,615	1,420,457
Portuguese East Africa	28,583	372,781	210,649
Egypt	197,926	705,415	908,527
Libya	56,984	405,623	454,805
Morocco (including Tangier)	10,566	184,068	169,088
Congo Republic	28,419	385,295	274,347
Sudan	122,192	832,619	1,296,717
Syria	102,921	293,212	422,695
Lebanon	80,065	410,681	564,853
Israel	158,247	614,146	1,202,789
Jordan	134,877	510,087	612,083
Saudi Arabia	56,595	377,350	531,823
Iraq	231,313	1,604,123	2,152,908
Iran	363,626	1,474,381	2,187,678
Burma	68,929	360,511	394,109
Thailand	34,094	374,402	429,788
Indonesia	51,057	725,332	1,576,815
China	20,114	870,044	511,586
Japan	69,517	508,889	496,956
United States of America	1,159,340	8,178,598	6,147,896
Cuba	47,111	221,815	170,313
Mexico	125,707	618,883	741,807
Colombia	56,012	315,829	307,821
Venezuela	93,372	2,388,361	708,230
Peru	83,622	196,109	342,420
Chile	122,732	556,877	919,779
Brazil	76,562	360,121	578,777
Uruguay	15,721	172,426	128,724
Argentine Republic	270,977	2,737,805	2,660,447
Other foreign countries	419,486	2,497,449	3,244,580
TOTAL	22,392,723	138,071,597	157,499,714

TABLE 3.—SOURCES OF ELECTRICAL IMPORTS

Country	Month of July	Seven months ended July	
	1961	1960	1961
	£	£	£
Australia	32,933	232,849	423,467
Canada	185,450	794,247	1,325,097
Other Commonwealth countries	350,206	1,447,364	1,786,730
Irish Republic	124,996	755,253	890,517
Sweden	299,924	703,657	1,671,366
Denmark	112,533	467,986	715,894
Western Germany	953,595	5,263,244	6,139,050
Netherlands	575,266	4,144,412	4,286,514
Belgium	58,181	302,959	393,412
France	484,917	1,210,897	2,022,652
Switzerland	255,718	1,129,329	1,531,036
Italy	117,143	876,648	815,533
United States of America	1,714,866	10,500,428	11,405,061
Other foreign countries	410,824	1,439,446	2,657,216
TOTAL	5,676,552	29,268,719	36,063,545

porating spin dryers, and water and gas turbines are other items that showed a strong upward trend.

As markets for British electrical goods, Australia and South Africa were well in the lead having taken so far this year £12·7 million and £11 million worth respectively. India follows with £8·2 million, Canada with £7·8 million, the Netherlands with £6·4 million and the United States with £6·1 million. Exports to the Common Market countries have so far this year risen by a third over the first seven months of 1960.

Imports Still Rising

Against the overall trend of falling imports, imports of electrical machinery and appliances rose again in July both compared with the previous month and July, 1960. Though the United States is still the outstanding supplier there have been big increases in imports from Sweden, Western Germany and France. Electronic apparatus and communication equipment is the dominant item in the electrical section, but there have been increases in practically all the products listed.

TABLE 4.—OTHER ELECTRICAL AND ALLIED EXPORTS

Class	Month of July	Seven months ended July	
	1961	1960	1961
	£	£	£
Domestic electric washing machines incorporating centrifugal water extraction	408,918	1,849,875	2,761,630
Other, with or without wringers	276,700	1,603,610	1,665,221
Dryers (exported as separate units)	9,306	268,609	222,561
Parts	171,070	825,074	1,129,977
Electric locomotives (incl. battery types)	—	2,090,285	1,557,346
Diesel locomotives with electric transmission	14,957	1,616,104	191,101
Welding electrodes:			
Ferrous	135,897	861,065	762,528
Non-ferrous	27,921	176,496	216,409
Electric conduit tubes and cased tubes	83,460	636,472	696,050
Electric carbons	156,562	888,819	1,220,350
Electric lighting fittings and lanterns (excl. arc lamps, searchlights and cycle lamps)	302,396	2,373,422	2,480,835
Electric fork-lift trucks	150,461	710,557	1,214,327
Water and gas turbines, etc,	552,380	2,923,659	5,553,016
Steam turbines	575,901	7,954,244	4,886,108

TABLE 5.—ELECTRICAL IMPORTS

Class	Month of July	Seven months ended July	
	1961	1960	1961
	£	£	£
Generators, incl. parts	135,342	531,674	789,297
Motors, incl. parts	272,854	1,262,622	1,794,491
Convertors; transformers; rectifiers	121,501	1,170,470	1,144,006
Switchgear and switchboards (other than telegraph and telephone)	141,183	1,010,401	1,442,877
Bulbs, arc lamps and tubes for electric lighting, complete	114,808	626,761	763,230
Cathode ray tubes, complete	37,258	380,165	252,378
Transistors (incl. photo-transistors), complete	95,703	754,988	625,256
Other, complete	234,328	1,705,818	1,870,054
Parts (excl. glass bulbs)	80,032	730,647	594,202
Radio receiving sets, domestic or portable	170,997	306,798	642,890
Radio communication and navigational aids, complete	685,258	2,875,583	3,468,725
Other radio and TV apparatus, parts and accessories	377,177	2,557,878	3,182,657
Telegraphy and telephony apparatus	103,405	413,407	474,256
Welding machinery	184,565	455,180	753,893
Electric cooking and heating apparatus	212,785	1,100,357	1,584,113
Magnetos, ignition, and electric appliances for aircraft, motor vehicles and cycles	429,097	2,108,835	2,250,399
Instruments, commercial	86,949	544,289	800,737
Electro-medical apparatus (incl. X-ray apparatus)	88,635	687,795	941,435
Portable mechanical appliances, electrically operated, complete	213,297	842,820	1,160,673
Parts	49,003	424,543	397,938
Industrial electronic control equipment	120,415	384,095	773,530
Scientific electrical instruments (excl. telegraphic and telephonic)	259,282	1,242,080	1,667,566
Other machinery, apparatus and appliances	1,462,678	7,151,513	8,688,942
TOTAL	5,676,552	29,268,719	36,063,545

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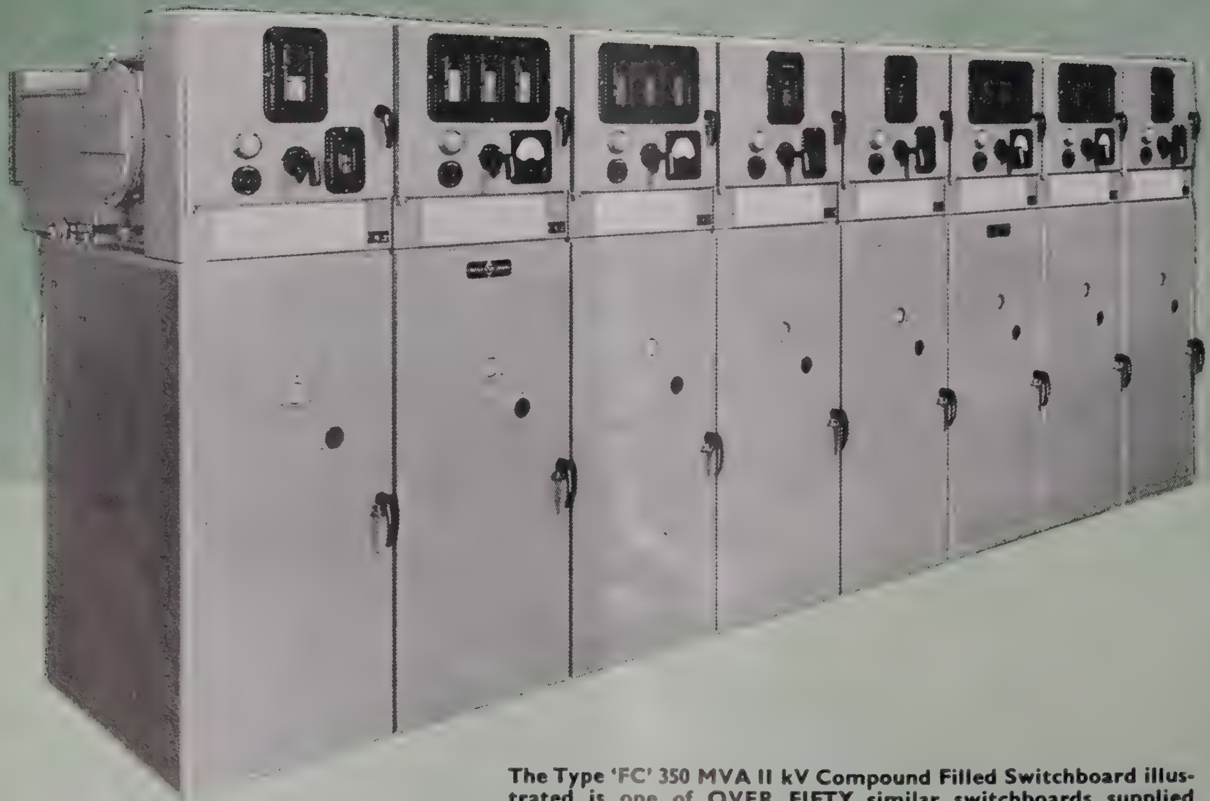

The Type 'FC' 350 MVA II kV Compound Filled Switchboard illustrated is one of OVER FIFTY similar switchboards supplied to the Government of KUWAIT Electricity Department.

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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 243a, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 4th to THURSDAY, 7th SEPTEMBER

Farnborough (Hants.).—Royal Aircraft Establishment. Society of British Aircraft Constructors. Annual flying display and aviation equipment exhibition.

MONDAY, 4th SEPTEMBER

Cardiff.—South Wales Institute of Engineers, Park Place, 7.30 p.m. A.S.E.E. South Wales Branch. "The Association," by E. K. N. Brittain.

Halifax.—Crown Hotel, Horton Street, 7.45 p.m. A.S.E.E. Halifax Branch. "Railway Electrification," by J. H. Leonard.

Ilford.—Angel Hotel, Ilford Broadway, 8.15 p.m. A.S.E.E. South Essex Branch. "The Durgapur Steel Works," by J. A. Hill.

Sheffield.—Royal Victoria Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. Chairman's address.

TUESDAY, 5th SEPTEMBER

Belfast.—Room C19, College of Technology, 6.45 p.m. Institute of Marine Engineers, Northern Ireland Panel. "Materials for Advanced Steam Conditions and their influence on operation of Marine Turbines and Boilers," by Cdr. H. E. C. Hims.

London.—White Hart, 49, King's Road, Chelsea, S.W.3, 7.45 p.m. A.S.E.E. West London Branch. "The Role of the Electrical Consulting Engineer in Industry," by W. H. Brooks.

Eltham Green School, Queenscroft Road, Eltham, S.E.9, 7.45 p.m. A.S.E.E. South East London Branch. "Colour Photography," by Miss Fosh.

Royal Society of Arts, John Adam Street, Adelphi, Strand, W.C.2, 7 p.m. Institution of Plant Engineers, London Branch. "Corrosion—Prevention by Cathodic Protection," by R. A. Lowe and J. S. McLachlan.

Reading.—Caversham Social Club, Caversham, 7.30 p.m. A.S.E.E. Reading and Districts Branch. "Lighting in Offices."

TUESDAY, 5th to FRIDAY, 15th SEPTEMBER

London.—Olympia. Seventh International Packaging Exhibition.

WEDNESDAY, 6th SEPTEMBER

London.—Wood Green Civic Centre, 8 p.m. A.S.E.E. North London Branch. "The Conception of Electrical Contracting," by G. G. Kitchener.

Manchester.—North Western Electricity Board Service Centre Theatre, Town Hall Extension, St. Peter's Square, 7.30 p.m. A.S.E.E. Manchester Branch. "Communal T.V. Distribution Systems," by M. G. Flynn.

Preston.—Farmer's Arms Hotel, Market Street. A.S.E.E. Preston Branch. Dinner and social evening.

WEDNESDAY, 6th to FRIDAY, 8th SEPTEMBER

London.—Institution Building, Savoy Place, W.C.2. I.E.E. Conference on "Microwave Measurement Techniques."

THURSDAY, 7th SEPTEMBER

Bradford.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford and District Branch. "Lighting in Home and Industry," by J. W. Howell.

Brighton.—Cricketers Hotel, Black Lion Street, 7.30 p.m. A.S.E.E. Brighton, Hove and District Branch. "Modern Trends in Coil Winding Wire," by C. P. Fox.

FRIDAY, 8th SEPTEMBER

Birmingham.—Lecture Theatre, Byng Kendrick Suite, Gosta Green College of Technology, Aston Street, 6.30 to 7 p.m. Society of Instrument Technology, Midland Section. Forum on "Instrument Maintenance."

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

16th September

Blue Ben. No. B185,672. Class 3. Cleaning preparations.—Benjamin Electric, Ltd., Brantwood Works, Brantwood Road, London, N.17.

Waste King. No. 806,367. Class 7. Dishwashing and laundry machines.—Waste King Corporation, U.S.A. Address for service: Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, London, W.C.2.

Circle and arrow design. No. 808,760. Class 7. Electrical machines and parts. Also No. 808,761. Class 9. Electrical and electronic apparatus.—British Refrasil Co., Ltd., Stillington, Stockton-on-Tees.

Auxilec. No. 809,209. Class 7. Machines, machine tools, motors (not for vehicles), incubators, air compressors, etc. Also No. 809,211. Class 11. Installations of lighting, heating, air conditioning, cooking, refrigerating, drying, etc.—Auxilec, Auxiliaries Electro-Mécaniques de Précision, France. Address for service: Pollak, Mercer & Tench, Audrey House, Ely Place, London, E.C.1.

Dishmax. No. 817,692. Class 7. Electric dish and cutlery washing machines—Max Arc, Ltd., 44/46, Terrace Road, Walton-on-Thames.

Ticino (design). No. B788,174. Class 9. Electrical apparatus and parts.—Societa per Azioni Bassani, Italy. Address for service: Bosshardt, Percival & Co., 94, Market Street, Manchester, 1.

Tesamaster. No. 811,747. Class 9. Mechanical, electronic and pneumatic measuring instruments.—Tesa, S.A., Switzerland. Address for service: George Ham & Co., 93-94 Chancery Lane, London, W.C.2.

Circular design. No. 811,837. Class 9. Synchronous frequency modifiers, condensers, convertors, transformers, switchboards, control apparatus, computers, power distribution apparatus, precipitators, electric irons, radio and television apparatus, telephone apparatus, electron microscopes, etc.—Kabushiki Kaisha Hitachi Seisakusho, Japan. Address for service: Marks & Clerk, 57-58, Lincoln's Inn Fields, London, W.C.2.

Selmar. No. 814,138. Class 9. Alarms and electrically operated anti-theft devices and automatically operated devices for raising and lowering the windows and roofs of vehicles.—Stellar Components, Ltd., 29-30, Bedford Row, London, W.C.1.

Unisel. No. B816,403. Class 9. Electrical installations and apparatus for use in the automatic control of industrial operations.—M.T.E. Control Gear, Ltd., London Road, Leigh-on-Sea.

Super-K Ceramicon. No. 817,900. Class 9. Ceramic condensers.—Erie Resistor, Ltd., Millora Works, Beevor Road, South Denes, Great Yarmouth.

Egret. No. 819,865. Class 9. Electrical apparatus for automatically controlling the operation of cooking equipment at a predetermined time.—Ralph Charles, Ltd., Dome Buildings, The Quadrant, Richmond, Surrey.

Thermascreen. No. 815,300. Class 11. Installations for refrigerating, cooling and ventilating purposes.—C. W. Brown (Engineers), Ltd., 55, Grange Park Avenue, Winchmore Hill, London, N.21.

Slimra. No. 816,432. Class 11. Electric heating and drying apparatus.—P. & R. Electrical (London), Ltd., 1, Berrymead Gardens, London, W.3.

Solartron. No. 816,469. All goods included in class 11.—Solartron Electronic Group, Ltd., Solartron Works, Farnborough, Hants.

Valor (shield design). No. 819,104. Class 11. Electrical appliances; and radiators for central heating.—Valor Co., Ltd., Bromford, Erdington, Birmingham, 24.

Rotolier. No. 821,063. Class 11. Lighting fittings, lampshades, and installations for lighting and heating—Rotaflex (Great Britain), Ltd., 4-10, Nile Street, London, N.1.

23rd September

EE on shield. No. B809,524. Class 7. Electric motors and controls; electric generators; and electrically operated tools.—Emerson Electric Manufacturing Company, U.S.A. Address for service: Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, Chancery Lane, London, W.C.2.

Seleromat. No. 806,826. Class 9. Scientific and electrical apparatus and instruments; welding apparatus; and apparatus for machining by electric spark erosion.—La Soudure Electrique Languepin, France. Address for service: H. D. Fitzpatrick & Co., 94, Hope Street, Glasgow, C.2.

Quenchalloy. No. 810,918. Class 9. Electrodes for electric welding.—Eutectic Welding Alloys Co., Ltd., 40-42, Copthall Avenue, London, E.C.2.

Seemark. No. 815,797. Class 9. Electric switches.—Seawork, Ltd., Burness House, 41, St. Mary Axe, London, E.C.3.

Unistat. No. 816,415. Electrical apparatus for measuring, indicating and testing.—English Electric Co., Ltd., English Electric House, Strand, London, W.C.2.

Circulume. No. 819,411. Class 9. Choking coils (impedance), condensers, electric starting switches and current transformers, all for use with electric lighting fittings.—Circulume, Ltd., 6, Tariff Street, Manchester, 1.

Mecpot. No. 820,378. Class 9. Trimmer potentiometers and precision resistors.—Miniature Electronic Components, Ltd., Henrietta House, Henrietta Place, London, W.1.

Sicodyne. No. 820,393. Class 9. Electrical control apparatus incorporating silicon-controlled rectifiers. **Quantimetre.** No. 820,391. Class 9. Electrical apparatus for indicating and controlling the level of liquid or solid materials in a container.—Lancashire Dynamo Electronic Products, Ltd., B.E.P. Works, Brereton Road, Rugeley, Staffs.

Portacon. No. 815,528. Class 11. Airfield lighting installations. — British Insulated Callender's Cables, Ltd., Norfolk House, Norfok Street, London, W.C.2.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Argyllshire.—North of Scotland Hydro-Electric Board. 132 kV transmission line. (See Classified Advertisement Section.)

Australia.—State Electricity Commission of Victoria, Melbourne. 20th November. Two 200 MW steam turbo-generators for Hazelwood power station. (E.S.B. 27035/61.)*

Controller, Stores and Contracts, G.P.O., Melbourne. 5th October. Transmitter parts. (E.S.B. 26723/61.)* Telephone timing clocks. (E.S.B. 26742/61.)*

Basingstoke.—Borough Council. 7th September. Group "A" fluorescent lighting installation, trunk road. Borough surveyor, Municipal Buildings, London Road.

Bath.—Corporation. 6th September. Re-wiring of 88 pre-war flats at Kingsmead. (See Classified Advertisement Section.)

Bury St. Edmunds.—Corporation. 11th September. Electric cookers. (See Classified Advertisement Section.)

Ceylon.—Ministry of Agriculture, Land, Irrigation and Power. 3rd October. 33 and 11 kV insulators. (E.S.B. 26165/61.)* 10th October. Steel-cored aluminium conductor and transmission line accessories. (E.S.B. 26726-7/61.)*

Chile.—Departmento de Materiales y Almacenes, Ferrocarriles del Estado. 31st October. Telecommunication equipment. (E.S.B. 26491/61.)*

Costa Rica.—Junta Administration del Servicio Electrico Municipal de Alajuela. 25th October. 33 kV transformer. (E.S.B. 26724/61.)*

Doncaster.—R.D.C. 22nd September. Trunk road lighting. (See Classified Advertisement Section.)

East Ham.—Borough Council. 12th September. Street lighting equipment. Borough engineer, Town Hall, East Ham, E.6.

Esher.—U.D.C. 25th September. Lighting installation, Portsmouth Road. (See Classified Advertisement Section.)

India.—Rajasthan State Electricity Board, Jaipur. 19th September. 33 and 11 kV isolating switches, drop-out fuses and lightning arrestors. (E.S.B. 26403/61.)*

Director General of Supplies and Disposals, New Delhi. 12th September. Ten rotary convertors. (E.S.B. 26406/61.)*

Rihand Hydro-Electric Design Directorate, Kanpur. 21st September. Two 33/11 kV, 3 MVA transformers. (E.S.B. 26408/61.)*

National Aeronautical Laboratory, Bangalore. 3rd October. Substation equipment. (E.S.B. 27041/61.)*

India Supply Mission. 23rd October. 1·0, 7·5 and 16 MVA transformers for Chandapura power station. (E.S.B. 27043/61/D.L.F.)*

Central Stores Purchase Department, Government of Andhra Pradesh, Hyderabad. 12th September. Switchboards and transformers. (E.S.B. 27040/61.)*

National Coal Development Corporation, Ltd., Ranchi. 20th September. Transformer welding sets. (E.S.B. 26756/61.)*

Heavy Electricals (India), Ltd. 1st November. Welding equipment. (E.S.B. 27078/61.)*

Maharashtra State Electricity Board. 28th September. Power transformers. (E.S.B. 27355/61.)*

Kuwait.—Department of Electricity, Water and Gas. 20th September. Switches and fuses. (E.S.B. 27319/61.)*

Laos.—Bureau d'Achat, Vientiane. 29th September. Overhead line equipment and tools, transformers, fuse cutouts, capacitors, etc. (E.S.B. 26789/61.)*

Malvern.—U.D.C. 15th September. Street lighting installation in residential area. C. C. Judson, surveyor, The Council House, Malvern.

Manchester.—South Manchester Hospital Management Committee. Applications are invited from firms wishing to be placed on the Committee's approved list for building, engineering, electrical and decorative work. (See Classified Advertisement Section.)

Newcastle-under-Lyme.—Borough Council. 11th September. Thirty-five Group "A" sodium lighting units, including conversion fitting for existing steel columns. Borough engineer, Lancaster Building, High Street, Newcastle, Staffs.

New Zealand.—G.P.O., Wellington. 19th September. Electric fans. (E.S.B. 26489/61.)* Electrical instruments. (E.S.B. 26488/61.)*

Wellington City Council. 19th September. Two 33/11 kV transformers and 11 kV switchgear. (E.S.B. 26779-80/61.)*

Nigeria.—Electricity Corporation of Nigeria. 30th October. 132 kV transmission line, Aba-Umuahia-Oji. (See Classified Advertisement Section.)

Northern Ireland.—15th September. Electrical installation in Crossmaglen Voluntary Intermediate School. Varming & Mulcahy, 37, Malone Road, Belfast, 9.

Norway.—N.A.T.O. Infrastructure Contract. 15th November. Semi-automatic telegraph relay equipment. Applications to tender by 11th September. (G.D. 159/60(30).)†

Oldbury.—Borough Council. 5th September. 154 Class "B" concrete street lighting columns, post top lanterns, lamps, time switches, control gear, etc. Borough engineer and surveyor, Municipal Bank Chambers.

Pakistan.—West Pakistan Water and Power Development Authority, Lahore. 19th October. Six 66 kV substations. (E.S.B. 26485/61.)*

Director of Supply, P.I.D.C. House, Motijheel, Dacca. 11th September. Electrical equipment including cable, meters and switches. (E.S.B. 26773/61.)*

Peru.—Posts and Telecommunications Department. 4th December. Modernisation of telecommunications and telegraph systems. (E.S.B. 26791/61.)*

Peterborough.—City Council. 19th September. Installation of 600 mercury and sodium lamps on steel and concrete columns. City engineer, Town Hall.

Sheffield.—City Council. 8th September. Supply of electric lamps to all departments of the Corporation from 1st October, 1961. John Heys, town clerk, Town Hall.

Syria.—Director General of Posts, Telegraphs and Telephones. 23rd September. Telegraph transmitters. (E.S.B. 26771/61.)*

Trinidad.—Trinidad and Tobago Electricity Commission. 2nd October. Insulator pins. (E.S.B. 26429/61.)* Aluminium conductors. (E.S.B. 26419-24/61.)*

United States.—Bonneville Power Administration. 12th September. Two 230/13·8 kV, 100 MVA transformers. (E.S.B. 27062/61.)*

Bureau of Reclamation. 19th September. Three shunt capacitor equipments and nine power circuit-breakers. (E.S.B. 27366-7/61.)*

Worksop.—Corporation. 11th September. Fluorescent lighting and wiring installation, Carlton Road Tip. (See Classified Advertisement Section.)

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Blyth.—Proposed Methodist youth centre (£26,000); S. W. Milburn & Partners, architects, 9, Esplanade, Sunderland.

Bristol.—Store premises, 60/66, East Street, Bedminster; Marks & Spencer, Ltd., Michael House, Baker Street, London, W.1.

Croydon.—Multi-storey car park, Fairfield (£300,000); town clerk, Town Hall.

Dover.—Twenty-storey flats, Townwall Road; Regents Park Land Co., Ltd., 22, Upper Grosvenor Street, London, W.1.

Dunstable.—Roman Catholic Church, West Street; Arthur Farebrother & Partners, architects, 99, Seymour Grove, Manchester.

Exeter.—Works, Marsh Green Road; Hardinge Machine Tools, Ltd., Hampton Road West, Hanworth.

Gainsborough.—Houses (44), Bridge Street, U.D.C. surveyor.

Gateshead.—Factory, Team Valley Estate, for Thomas De La Rue, Ltd., 84, Regent Street, London, W.1.

Hull.—Three-storey shops and showrooms, 20/30, Brook Street; town planning officer, the Guildhall.

Ipswich.—Erection of bakery (about £100,000); H. Halpern & Partners, architects, 58-60, Cannon Street, London, E.C.4.

Kendal.—Operating theatre suite, Westmorland County Hospital; Manchester Regional Hospital Board, Cheetwood Road, Manchester, 8.

Kidderminster. — Eleven- and six-storey blocks of flats and four-storey maisonnettes, Hurcott Road clearance area; borough engineer, 110, Mill Street.

London.—Block of flats, Gloucester Square, Bayswater; Fry, Drew & Partners, architects, 63, Gloucester Place, W.1.

Factory extension, Hanwell; Acorn Anodising Co., Ltd., Cambridge Road, W.7.

Eight-storey office block, Upper Richmond Road, Putney; Ronald Lyon Estates, Ltd., Lyon House, Hersham, Surrey.

Manchester.—Twenty-storey office block, Portland Street and Sackville Street; Leach, Rhodes & Walker, architects, 90, Deansgate.

Maryport (Cumberland). — Infants' and junior school; N. M. Phillips, architect, Grosvenor House, Warwick Square, Carlisle.

North Riding.—Revised scheme for new town of 3,000 houses at Hemlington Park, near Middlesbrough; John T. Bell & Sons, builders, Market Street, Newcastle-on-Tyne.

Oldham.—Houses (74), Littlemoor Lane redevelopment area; Cameron & Middleton, quantity surveyors, 21, Mumps, Oldham.

Peterborough.—Extensions to Lincoln Road Boys' School ((£64,746); architect to Joint Education Board, Bridge Street.

Redruth.—Factory for Tecalemit, Ltd., Plymouth; Walls & Pearn, architects, Armada Way, Plymouth.

Rhyl.—Church of St. Anne, Vale Road; Garnett & Cloughley, architects, 10, Kinmel Street.

Stoke-on-Trent. — Multi-storey flats, Bucknall/New Road area; J. R. Piggott, city architect, Kingsway.

Tonbridge.—Further stage of new buildings for Hugh Christie Secondary School (£76,000); E. T. Ashley Smith, county architect, Springfield, Maidstone.

Wallasey.—Secondary technical school for girls, Leasowe; borough architect.

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* This information is extracted from the Board of Trade *Export Service Bulletin*. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given. †Telephone: Trafalgar 8855, Ext. 2010.

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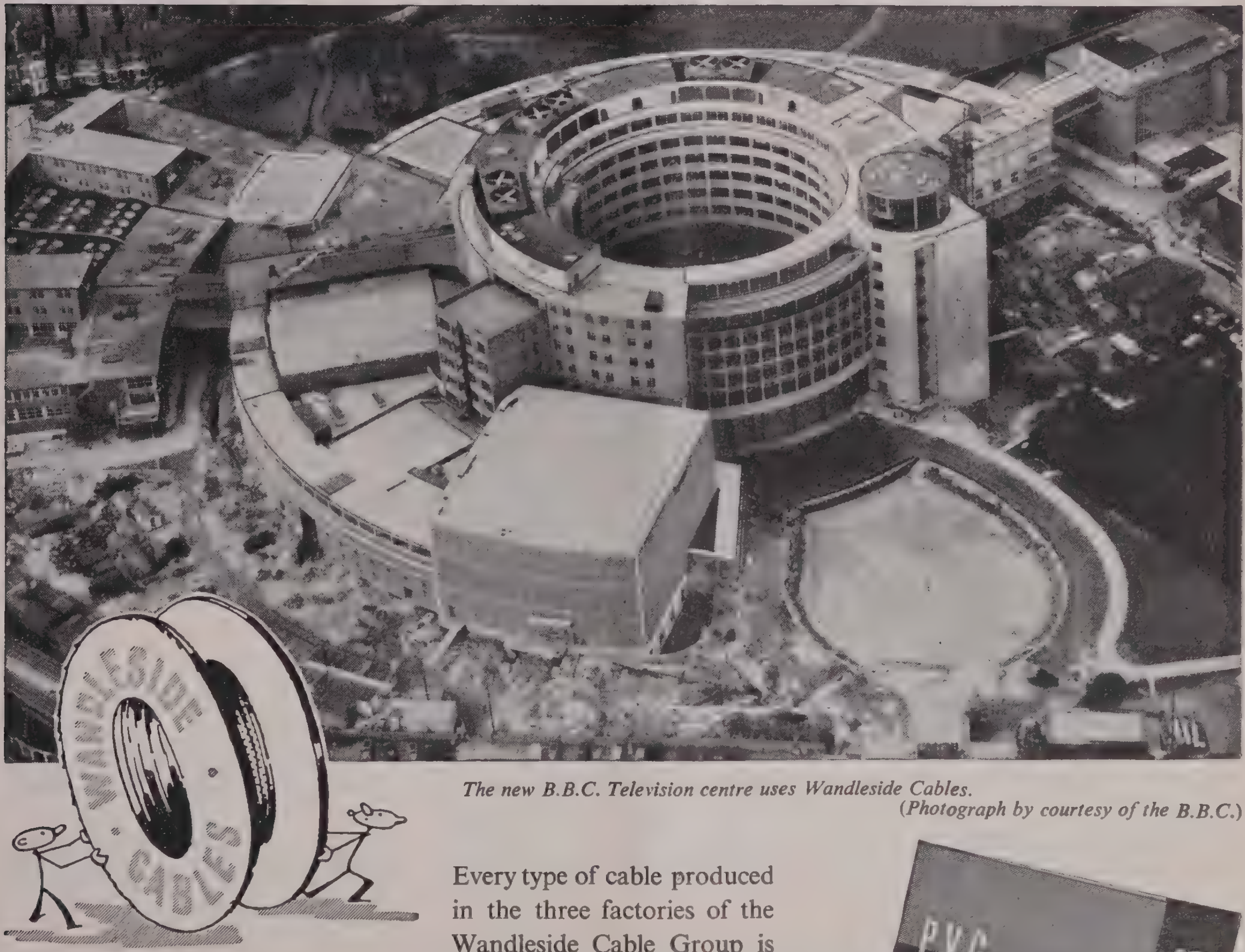

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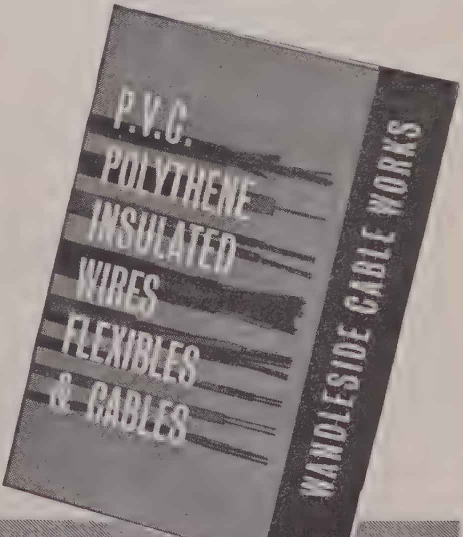

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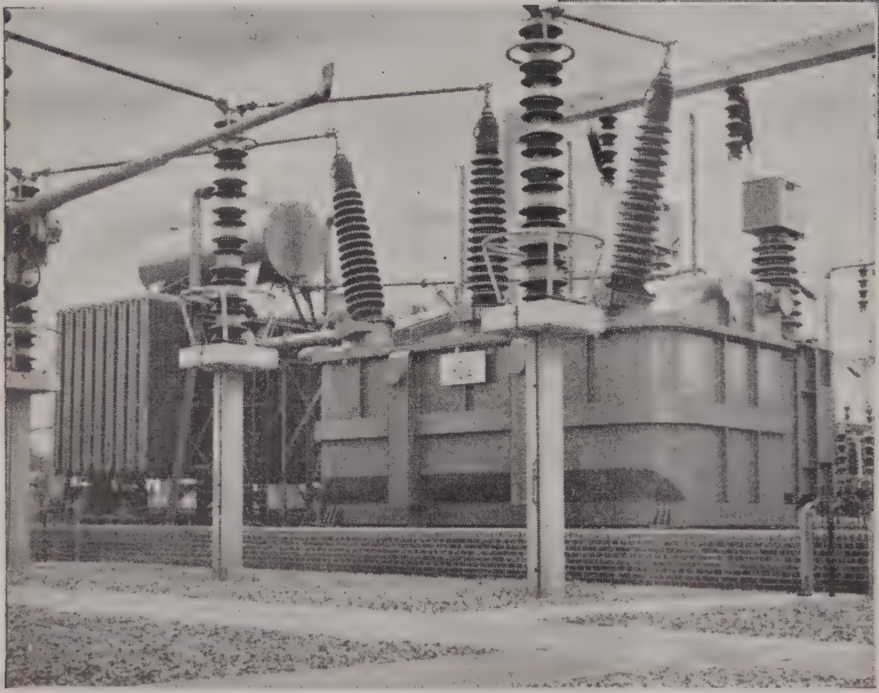

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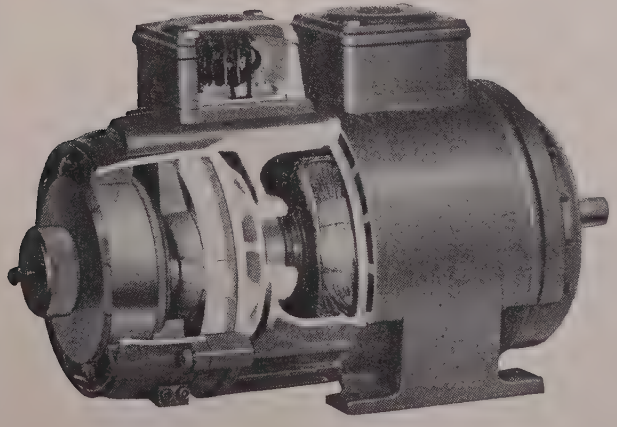

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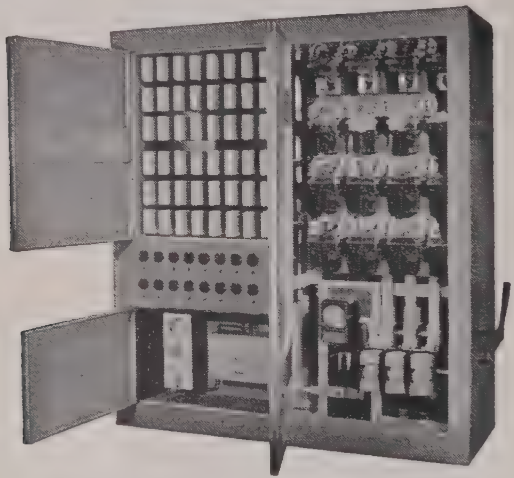

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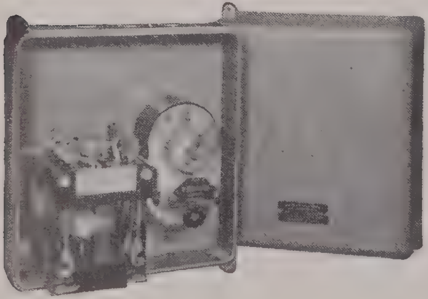

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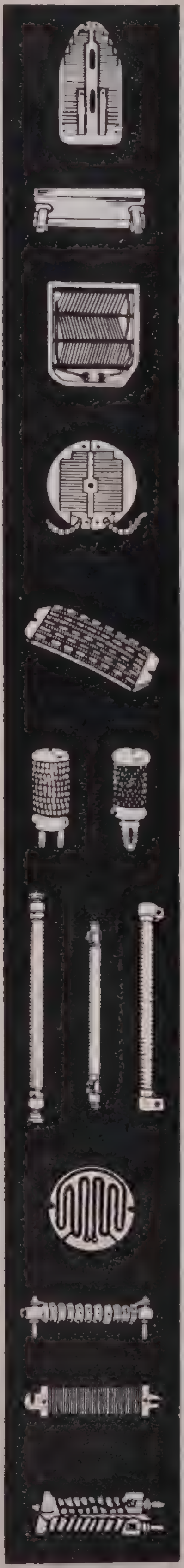

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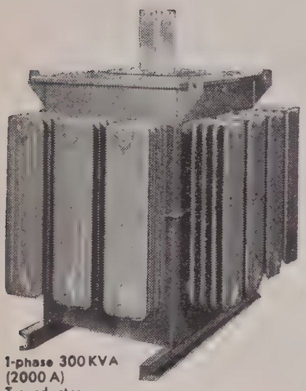

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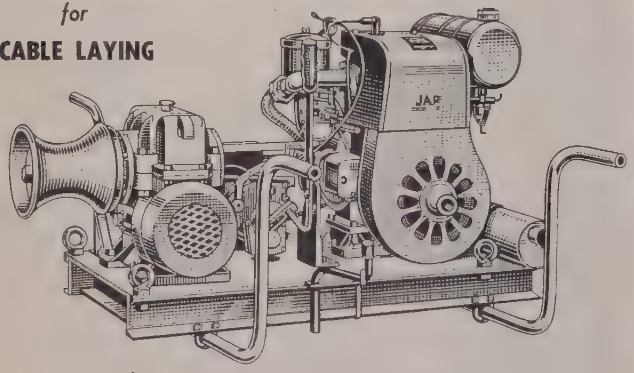

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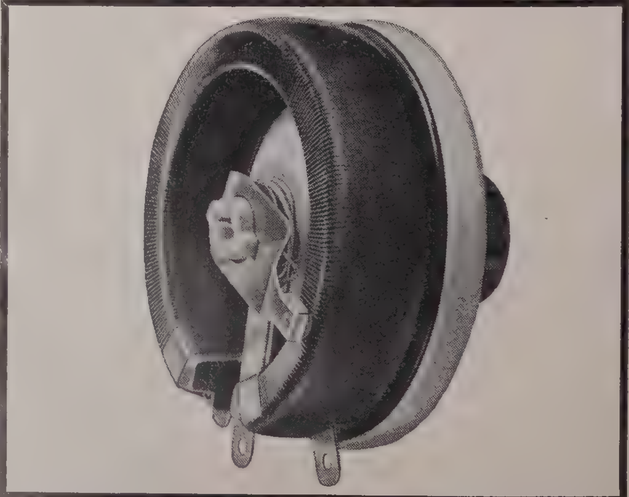

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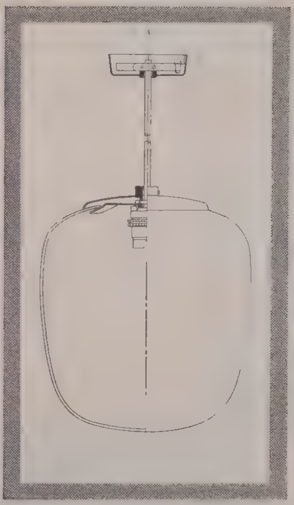

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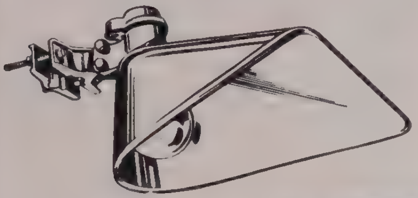

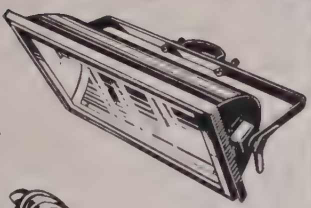

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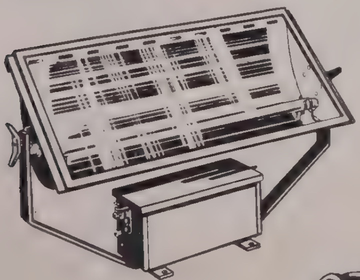

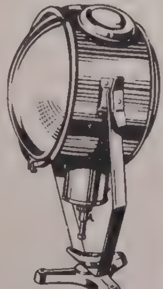

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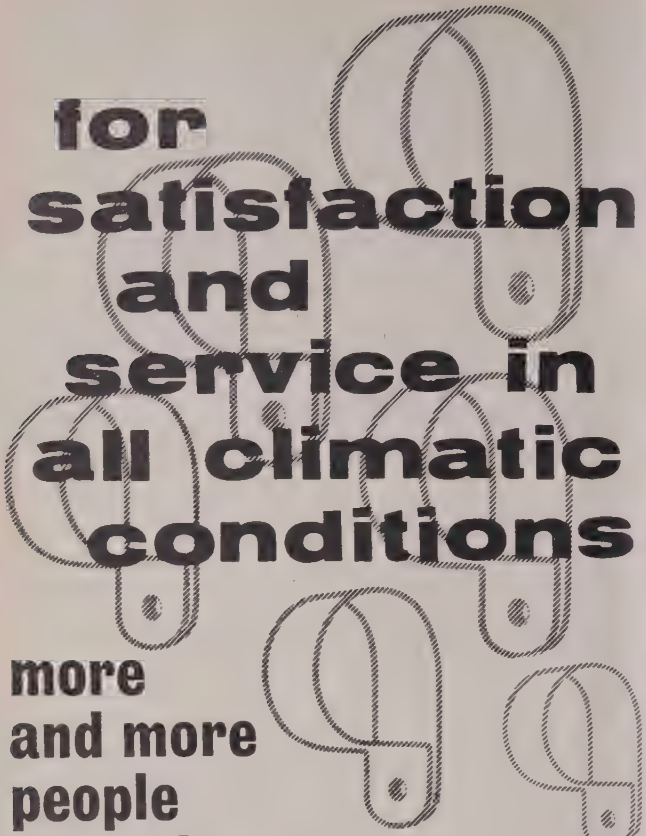

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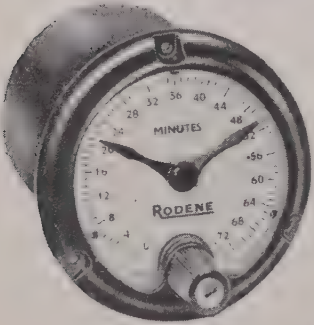

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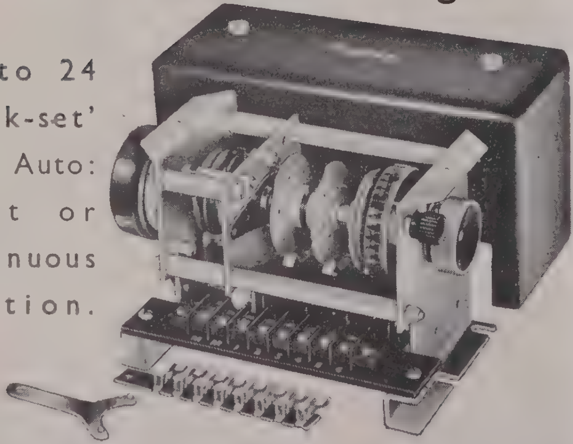

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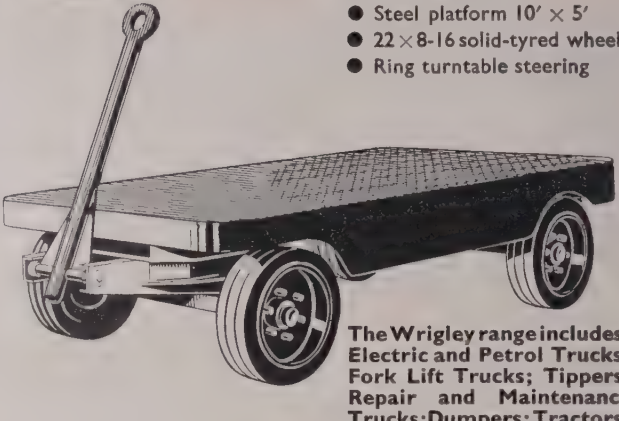

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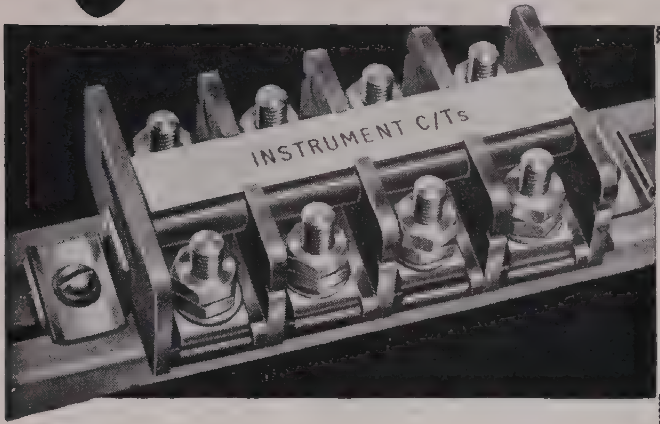

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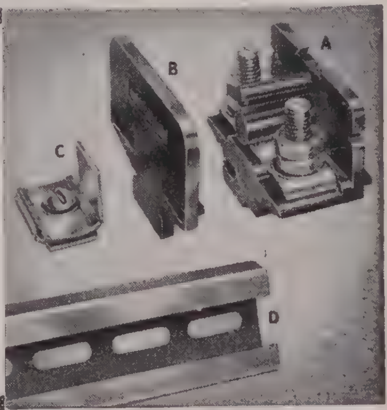

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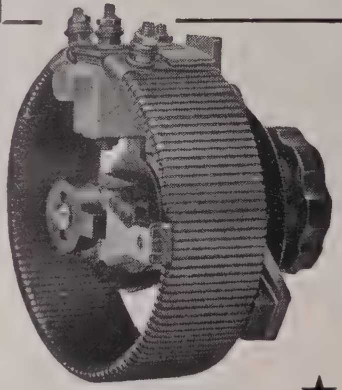

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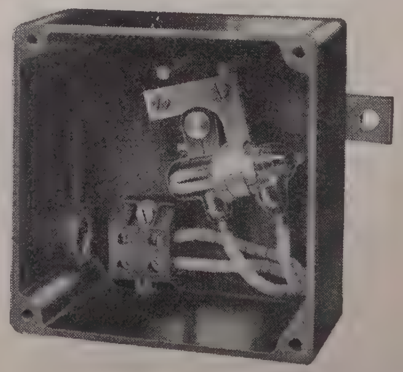

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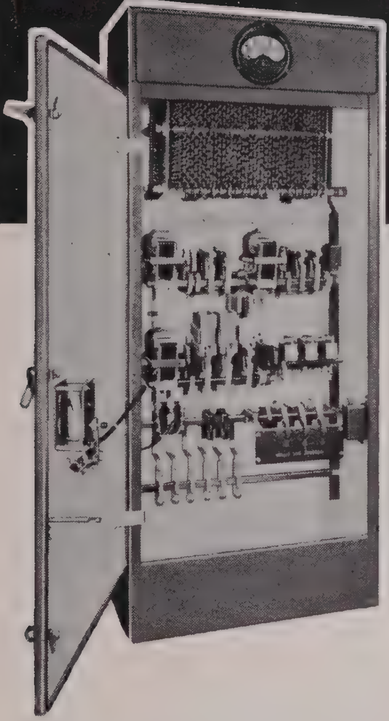

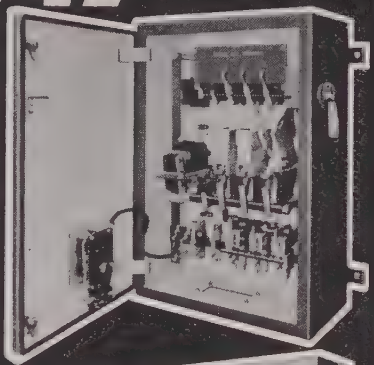

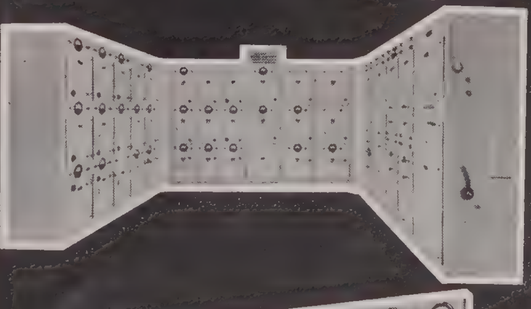

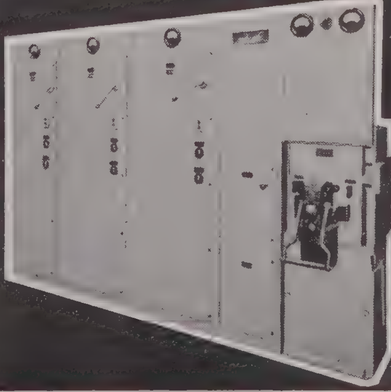

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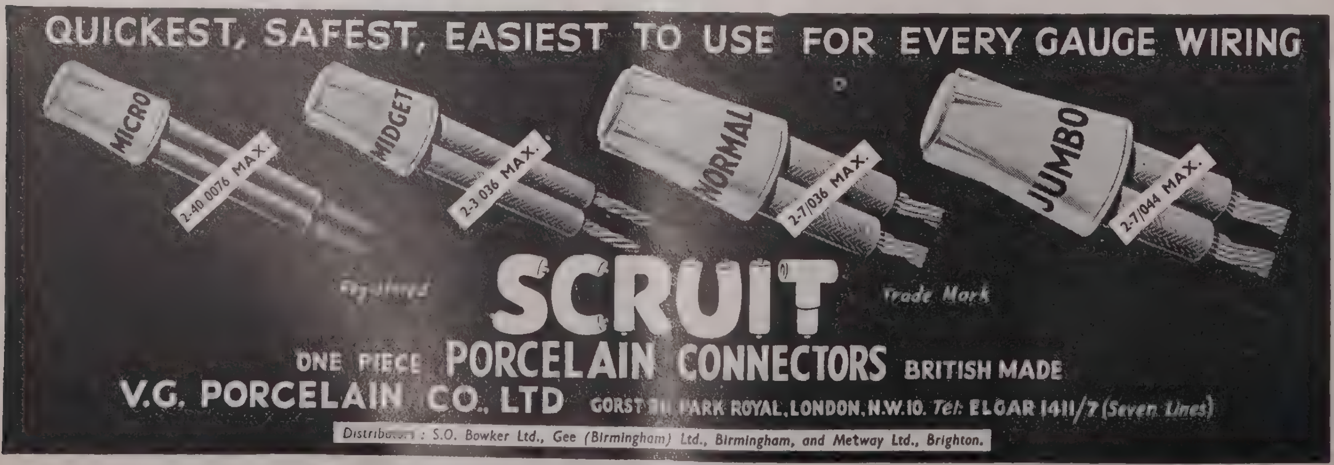

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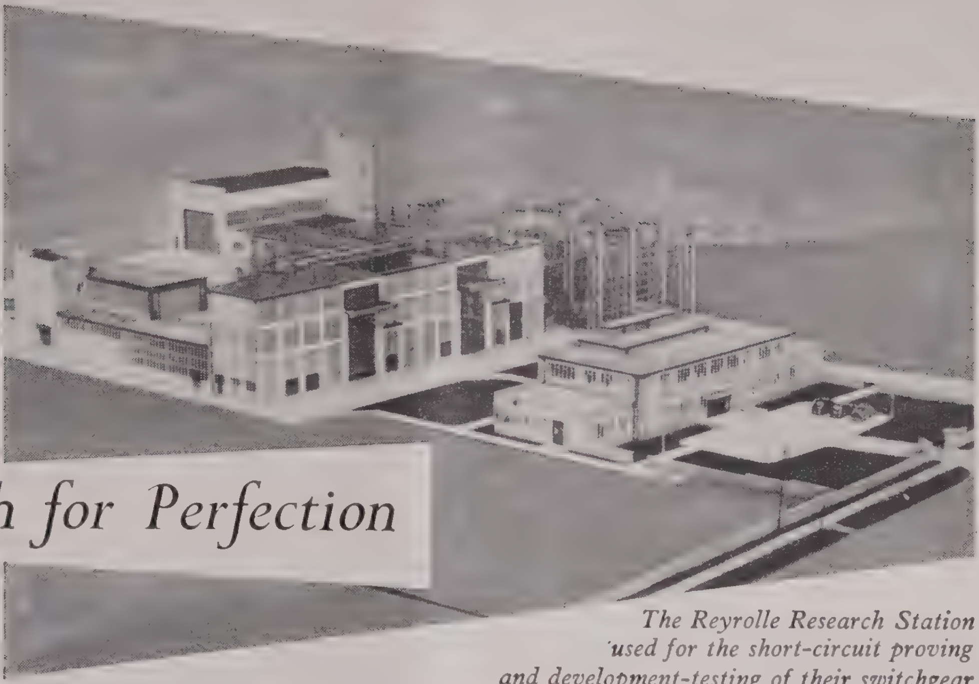

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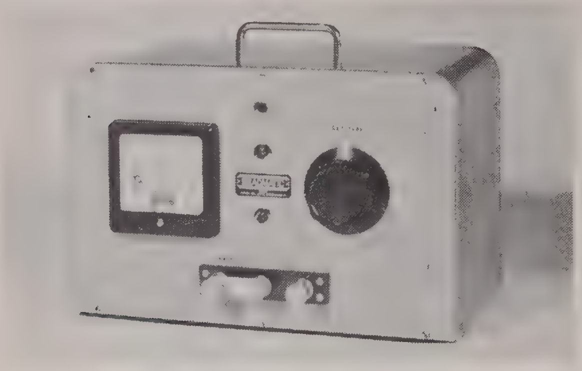

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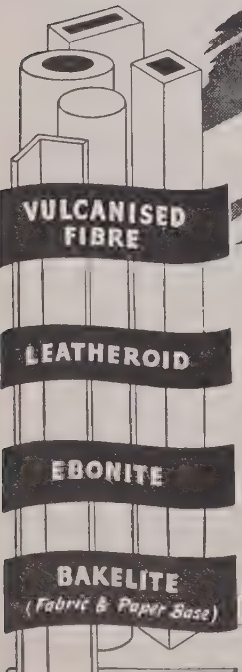

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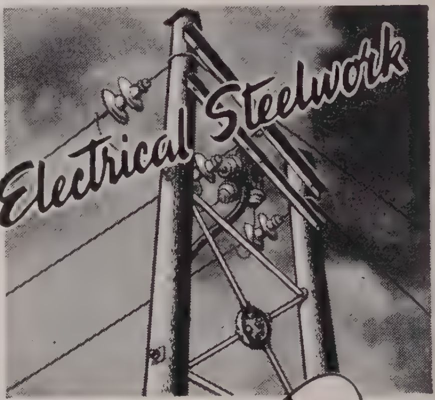

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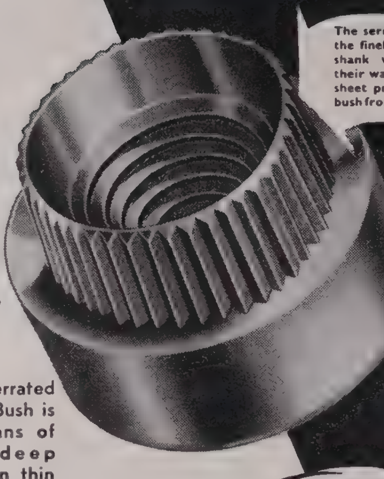

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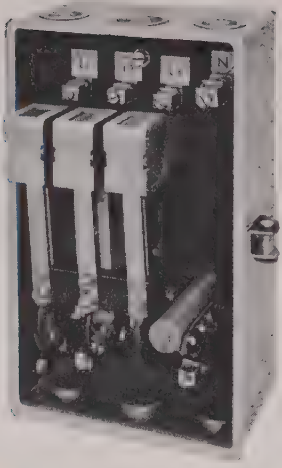

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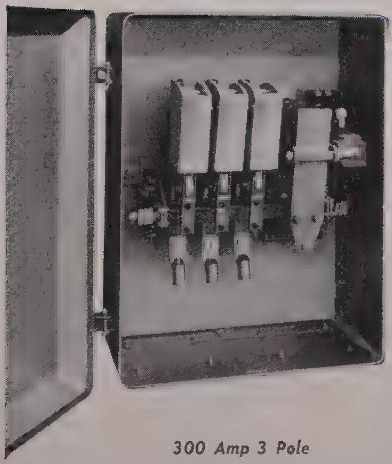

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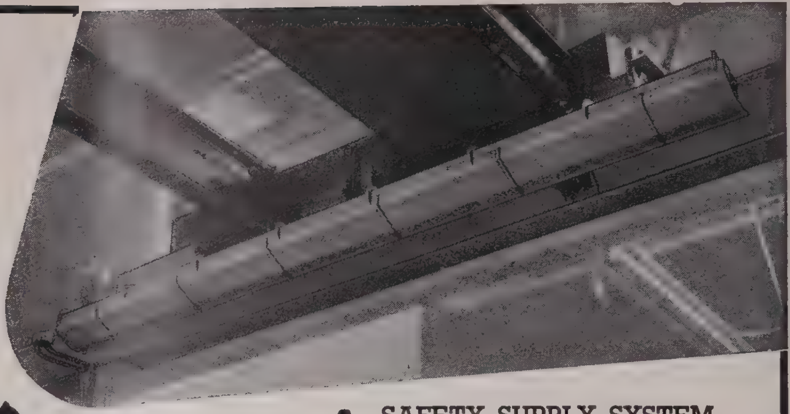

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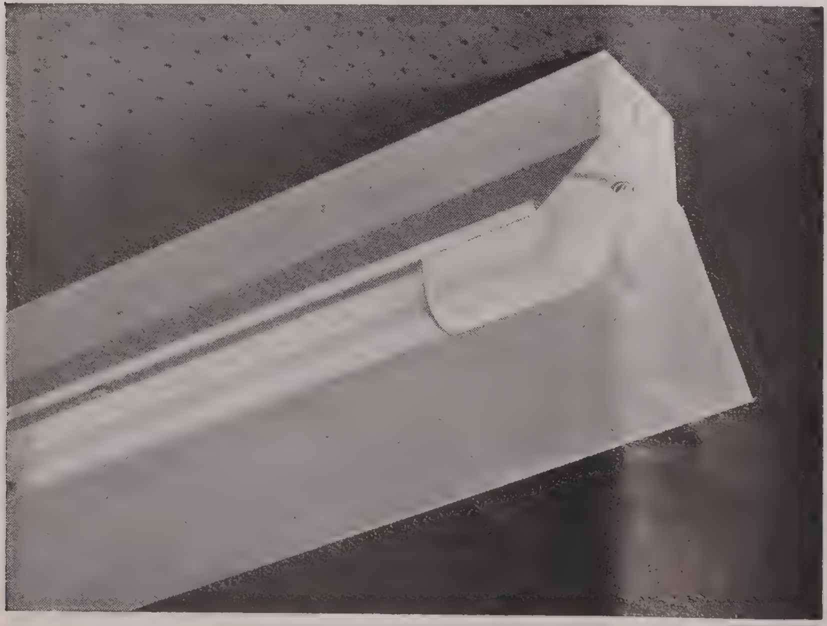

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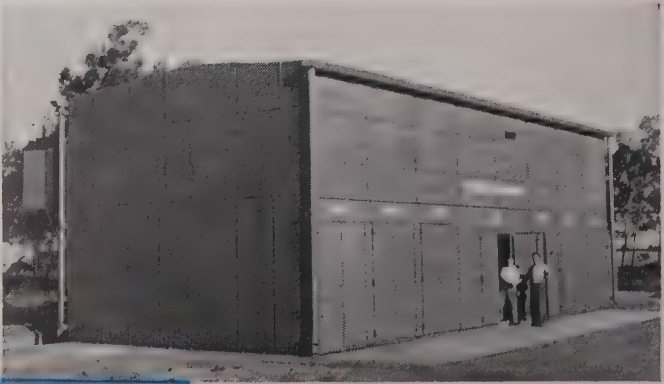

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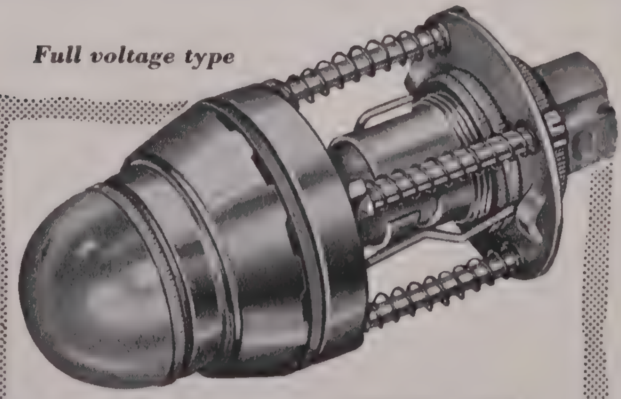

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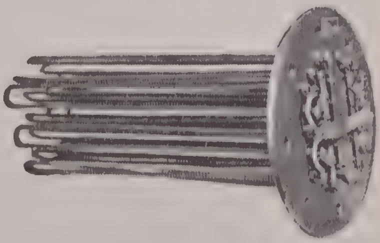

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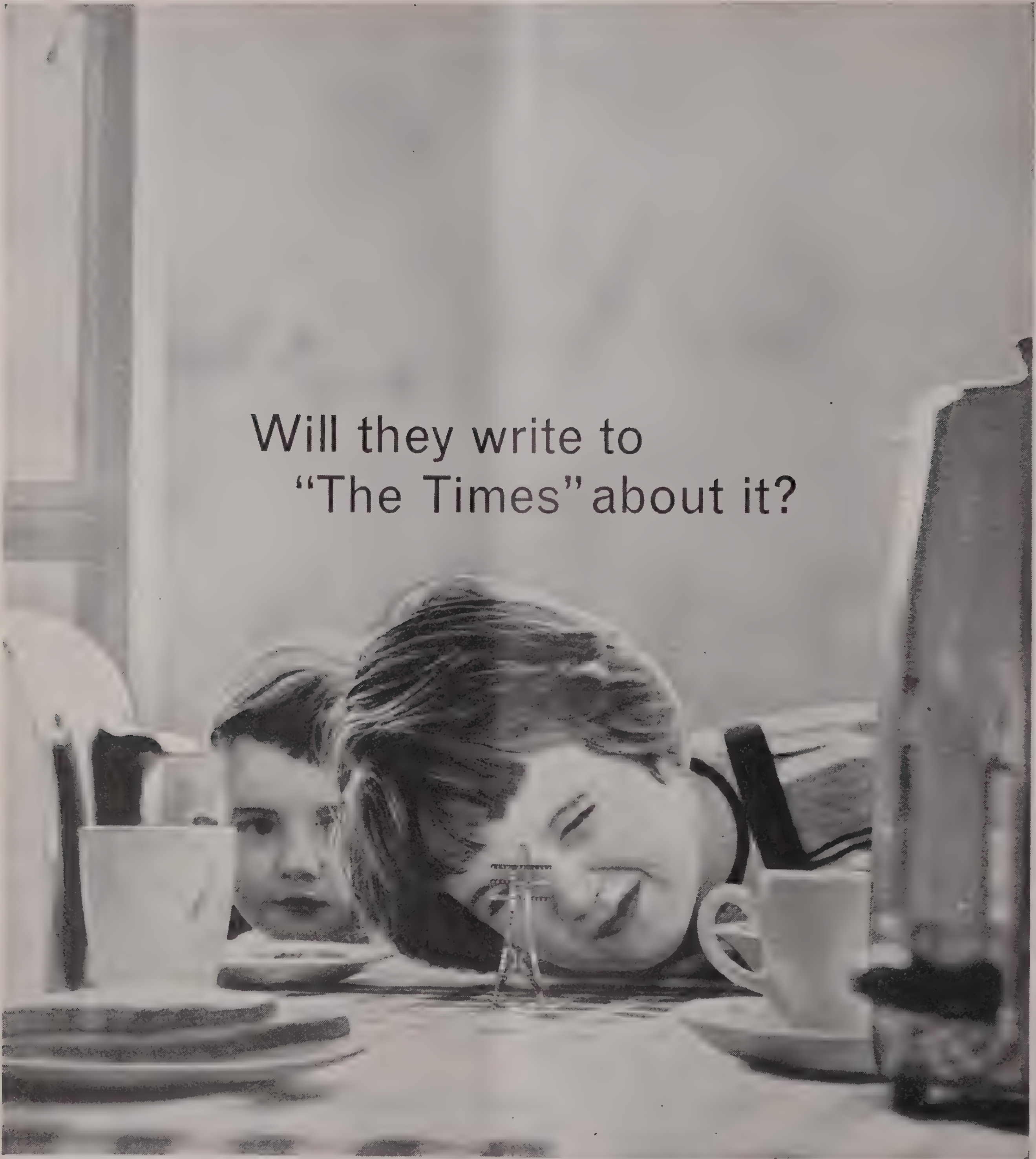

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(*Continued on page* 78)

(Continued from page 77)

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(Continued from page 78)

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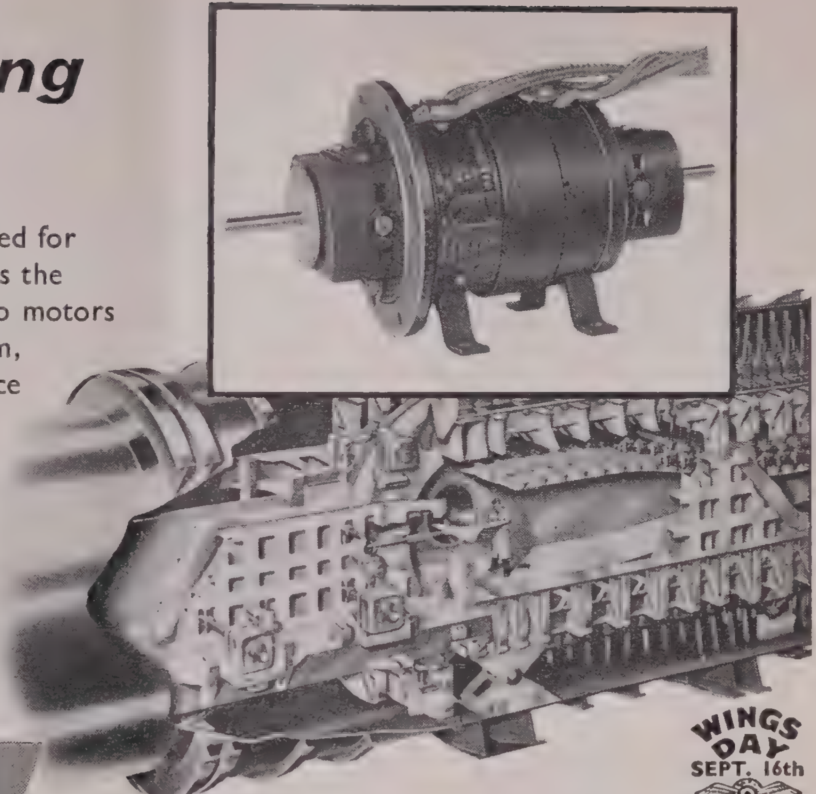

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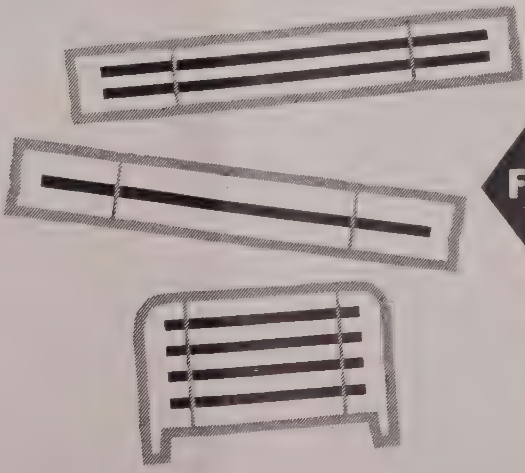

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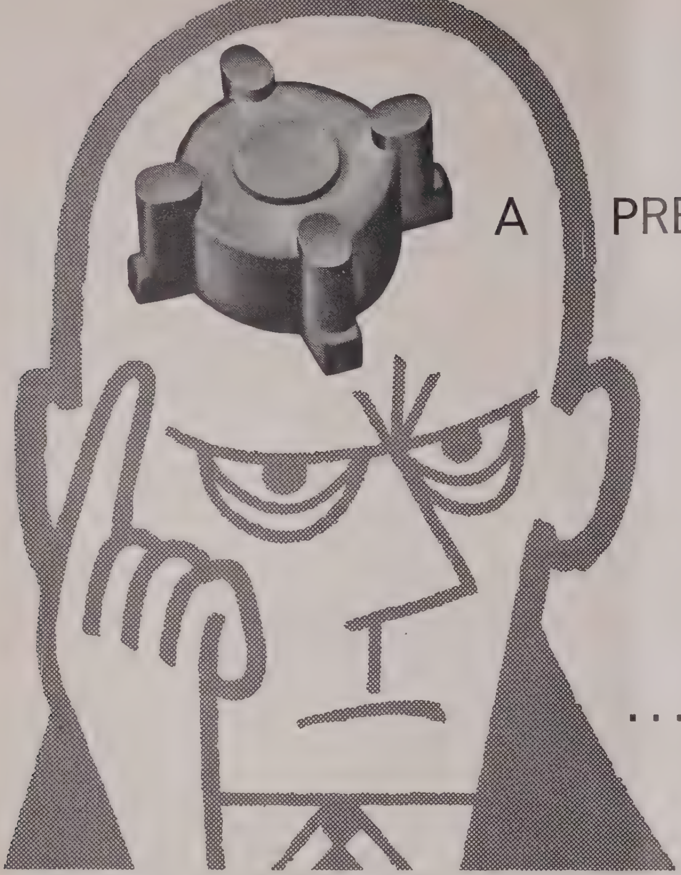

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This electrolyte which is quite innocuous to most printed circuit adhesives, provides a fine gold deposit, of low stress and porosity, possessing a hardness of not less than 100 D.P.N. The process is readily controlled and compared with more conventional processes, the throwing power is at least as good. The deposits are readily soldered, have a low electrical contact resistance and possess superior mechanical properties to those obtained from conventional fine gold solutions.

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Advertisements are accepted up to **first post on Monday** of the week of issue

If blocks, bold type or ruled borders are required then on **Friday** prior to week of issue

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Dorset House, Stamford Street
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Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

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132-kV Single-circuit Transmission Line: Aba/Umuahia/Oji

TENDERS are invited for the supply and erection of approximately 90 miles of single-circuit 132-kV Transmission Line between Aba/Oji River Power Station.

The contract includes for the manufacture, supply, testing, insurance, packing for export, shipment to a tropical climate, complete delivery to site, erection, testing, commissioning and maintenance for 12 calendar months of the whole of the contract works.

A short précis of the extent of the works for which complete and comprehensive offers are invited may be had on application to the Resident Engineer, The Electricity Corporation of Nigeria, Adelphi, John Adam Street, London, W.C.2, or the Secretary, Electricity Corporation of Nigeria, 13, Broad Street, Private Mailbag 2030, Lagos.

Tender documents, which will be available from the 31st August, 1961, may be obtained from the same addresses on receipt of payment by cheque of £12 in favour of the Electricity Corporation of Nigeria. This payment will not be refundable.

Completed tender must be under sealed cover endorsed "Tender for Aba-Umuahia-Oji 132-kV Transmission Line," and must be received at the office of the Resident Engineer, The Electricity Corporation of Nigeria, Adelphi, John Adam Street, London, W.C.2, by 12 noon on 30th October, 1961.

The Electricity Corporation do not bind themselves to accept the lowest or any tender nor will they be responsible for any costs incurred by tenderers in making their tender.

G. W. E. NICOL,
Secretary to the Corporation.

2114

BOROUGH OF WORKSOP

TENDERS are invited for the provision of nine Fluorescent Lighting Units, eight Socket Outlets and necessary wiring in a building at Carlton Road Tip, Worksop. Tenderers may quote for:—

(a) The supply only of lanterns, tubes and auxiliary gear.

(b) The wiring and fixing of lanterns, etc.

(c) The whole of the work.

Copies of the specification and form of tender may be obtained from the Borough Engineer, Park House, Worksop.

Tenders, in envelopes provided, must be forwarded to the undersigned so as to arrive not later than 10 a.m. on 11th September, 1961.

The Corporation do not bind themselves to accept the lowest or any tender.

R. C. PHARAOH,
Town Clerk.

Town Hall, Worksop.

2111

THURROCK URBAN DISTRICT COUNCIL

Tenders for Electrical Installations

APPLICATIONS are invited from Electrical Installation Contractors who wish their names to be included on a list from which firms may be selected to submit tenders for this type of work.

Applicants must be members of either:—

(a) The National Inspection Council of Electrical Installation Contractors or

(b) The Electrical Contractors Association.

Contractors wishing to be considered should forward their names to Mr. C. S. H. Hawkes, M.I.C.E., M.I.Mun.E., M.R.S.H., Engineer & Surveyor, Council Offices, Palmer's Avenue, Grays, not later than first post, Monday, 11th September, 1961.

The application should be accompanied by a declaration showing to which of the above bodies they belong and a list of authorities for whom they have executed work.

A. E. POOLE,
Clerk of the Council.

Council Offices,
Whitehall Lane, Grays.
16th August, 1961.

2077

DONCASTER RURAL DISTRICT COUNCIL

Trunk Road Lighting Installation, Route A.614 (Thorne Road), Austerfield

FIXED price tenders are invited from experienced contractors for the supply and installation of a total of 64 Street Lighting Units located on the above Trunk Road.

Each lighting unit will consist of a totally enclosed lantern equipped with a 140-watt sodium lamp, mounted on a 25-ft. steel column, together with all necessary auxiliary equipment.

Forms of tender, specifications and bills of quantities may be obtained from, and the conditions of contract and drawings inspected by appointment with, the Surveyor to the Council at the address below.

Tenders in plain sealed envelopes endorsed "Trunk Road Lighting, Contract No. 385," must be delivered to the undersigned not later than Friday, 22nd September, 1961.

B. MELDRUM,
Clerk to the Council.

Council Offices,
Nether Hall, Doncaster.

2112

SOUTH MANCHESTER HOSPITAL MANAGEMENT COMMITTEE

APPLICATIONS are invited from firms who wish to be placed on the approved list of firms who may be invited from time to time to tender for carrying out building, engineering, electrical and decorative works at the hospitals and clinics under the control of the committee.

Application forms may be obtained from the Group Supplies Officer, Withington Hospital, Manchester, 20.

2113

CITY OF BATH

Re-Wiring 88 Pre-War Flats at Kingsmead

TENDERS are invited for re-wiring the whole of the lighting installation and wiring new socket outlets in all flats.

The specification and particulars of the electrical installation may be obtained from the City and Waterworks Engineer, Guildhall, Bath, and the standing orders may be examined at his office upon the payment of £2 2s., which will be refunded on receipt of a bona fide tender.

Tenders must be sealed and delivered in the envelope provided not later than noon on the 6th September, 1961, to the Town Clerk, Guildhall, Bath.

The Council does not bind itself to accept the lowest or any tender.

Tenders will only be considered from electrical contractors who are entered on the National Register of Electrical Installation Contractors and/or members of the Electrical Contractors' Association (Inc.) as duly qualified to carry on business within the rules and conditions of the National Register and/or Electrical Contractors' Association (Inc.).

JARED E. DIXON,
Town Clerk.

Guildhall, Bath.
22nd August, 1961.

2109

BOROUGH OF BURY ST. EDMUNDS

Supply of Electric Cookers

TENDERS are invited for the supply of 20 G.E.C. Mexborough Electric Cookers, Cat. No. D.C.757E, with 8-in. radiant plate and simmerstat.

Cookers are to be delivered to the Corporation Yard, Bury St. Edmunds.

Tenders should be forwarded to the undersigned not later than 12 noon, 11th September, 1961 (in envelopes marked "Tender, Electric Cookers").

The Corporation do not bind themselves to accept the lowest or any tender.

RICHARD R. HILES,
Town Clerk.

Borough Offices,
Bury St. Edmunds.
24th August, 1961.

2170

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

TENDERS are invited for the construction of a 132-kV single-circuit Steel Tower Line, approximately 3 miles route length, in the County of Argyll.

Tender documents may be obtained on application with the deposit of £2 2s. (returnable) to the Engineers, Messrs. Merz & McLellan, 72a, George Street, Edinburgh, 2.

The Board do not bind themselves to accept the lowest or any tender.

2171

Official Notices (continued)

ESHER URBAN DISTRICT COUNCIL

Installation of Street Lighting, Portsmouth Road (A.3), Esher

Contract No. 325

THE Council are prepared to receive tenders for the provision and erection of 27 25-ft. mounting height Steel Columns and Brackets, the provision and fixing of 27 enclosed Lanterns, Sodium Vapour Lamps and control gear and ancillary works.

Form of tender, conditions of tender, specification and bills of quantities may be obtained from the Engineer and Surveyor and Planning Officer, Council Offices, Esher, on payment of a deposit of one guinea, which will be refunded on the receipt of a bona fide tender, together with the return of all documents in good condition. Drawings and conditions of contract may be inspected at the office of the Engineer and Surveyor and Planning Officer during normal working hours.

Tenders on the prescribed form, enclosed in the envelope provided, endorsed "Contract No. 325," and bearing no name or mark indicating the sender, must be addressed to the undersigned and received by him not later than 5 p.m. on Monday, 25th September, 1961.

The Council do not bind themselves to accept the lowest or any tender.

FREDERICK EDWARDS,
Clerk of the Council.
Council Offices,
Esher.
2110

LEEDS REGIONAL HOSPITAL BOARD

To Heating and/or Electrical Contractors

TENDERS are invited for carrying out Electrical Installation at the Lloyd Hospital, Bridlington.

Applications for form of tender and specification and drawings, accompanied by a deposit of £2 2s. (which will be refunded on receipt of a bona fide tender and other contract documents), must be made to the Regional Engineer at the undermentioned address not later than 12 noon on Wednesday, 6th September, 1961. Cheques should be made payable to the "Leeds Regional Hospital Board" and crossed.

A copy of the drawings, conditions of tender and conditions of contract may be inspected at the office of the Regional Engineer (or at the office of Messrs. Leake & Wilson (Consultant Engineers), Oriel Chambers, 27, High Street, Hull.

Sealed tenders, in the endorsed envelope provided, must be delivered to the undersigned not later than 12 noon on Monday, 2nd October, 1961.

The Board does not bind itself to accept the lowest or any tender.

WM. A. SHEE,
Secretary to the Board.
Park Parade,
Harrogate, Yorks.
2090

GHANA SUPPLY COMMISSION

THE GHANA SUPPLY COMMISSION invite manufacturers to submit quotations for the following :—

Reference ELEC. 4082/1.
Description : Underground Paper-insulated Lead-covered and Armoured Cables :—
(A) 11,000 volts — 31,000 yds.
(B) 3,000 volts — 13,000 yds.
(C) 1,100 volts — 24,000 yds.

Specifications for the cables will be obtainable as from the 30th August, 1961, on payment of a fee of £1, from the Secretary, Ghana Supply Commission, Post Office Box M-35, Accra. The closing date for receipt of quotations will be 4th October, 1961.

2109

SITUATIONS VACANT

(See "Replies to Box Numbers" on page 83)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

Central Gloucestershire Area

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (Dean Forest).

Applicants should have a sound commercial background, including a thorough knowledge of industrial, commercial and rural development work. Technical qualifications desirable. Salary £890/£1,015 per annum (N.J.B. Grade E.8).

Apply by letter within 14 days stating age, experience, present position and salary to Mr. S. Raybould, Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

North Staffordshire Area

GENERAL ASSISTANT DISTRICT ENGINEER (Newcastle).

Duties include assistance on the planning, construction and maintenance of H.V. and L.V. overhead and underground mains. Technical qualifications desirable. Salary £715/£805 per annum (N.J.B. Grade F.12).

Apply by letter within 10 days stating age, experience, present position and salary to Mr. C. C. Pimble, Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

F. W. CATER,
Secretary.
2153

BRITISH INSULATED CALLENDER'S (SUBMARINE CABLES) LTD.

require an ELECTRICAL ENGINEER to undertake development work on submarine power cables and accessories. The selected candidate will be required to organise and progress the development work up to production against customers' requirements.

Applicants should hold an Engineering Degree, H.N.C. or its equivalent, and preferably have a knowledge of power cable design and manufacture.

Staff pension scheme. Canteen and social club facilities.

Applications should be addressed to the Secretary, British Insulated Callender's (Submarine Cables) Ltd., Trafford Park, Manchester, 17.

2135

THE INSTITUTION OF ELECTRICAL ENGINEERS

APPLICATIONS are invited for the appointment of SECRETARY of the Institution of Electrical Engineers, which will become effective in October, 1962, and should be sent to the President of the Institution, Savoy Place, London, W.C.2, marked on the top left-hand corner "Secretaryship," to arrive not later than the 20th September, 1961.

Candidates should preferably be between the ages of 40 and 50 years and desirably be Corporate Members of the Institution. There is an adequate superannuation scheme, and the conditions of service and salary will be commensurate with the high responsibility of the post, but not less than a basic figure of £4,000.

The selected candidate would be required to commence his service in June, 1962, and work for three months in collaboration with the retiring Secretary.

2120

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

APPLICATIONS are invited from suitably qualified engineers for the following superannuable appointment :—

THIRD ASSISTANT ENGINEER (Planning and Development).

Candidates for this post should preferably be in possession of the H.N.C. in Electrical Engineering or equivalent qualification, and should have a sound engineering training with subsequent experience in the design and layout of large distribution systems at pressures up to and including 33 kV in a densely loaded industrial and residential area. A knowledge of the application of modern protective equipment and of the calculation of fault levels and preparation of load flow diagrams is desirable.

Salary £1,190-£1,325 per annum in accordance with Class L, Grade 10 (Scale 10) of the N.J.B. Salary Scale.

The successful candidate for this post shall be required to reside within reasonable travelling distance of Area Headquarters.

Applications, quoting reference No. GE/56/61, should be submitted on the standard application form, which is obtainable from the Area Secretary, P.O. Box 6, 75, Waterloo Street, Glasgow, C.2, and returned not later than Friday, 15th September, 1961.

2116

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

APPOINTMENT of SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER, Lanark District.

Applications are invited for the above superannuable appointment.

Applicants should have had a sound engineering and technical training and subsequent experience in the development of commercial, industrial and domestic loads and of "off peak" supplies, with a good knowledge of heating installation, including floor warming. They will also be required to assist in the general work of the Commercial Department.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A, the present classification and grading being E.7, salary £965/£1,090 per annum.

Application forms, which can be obtained from the Manager, Montrose Crescent, Hamilton, should be returned to this office within 14 days from the date of this advertisement.

2151

J. & P.

SALES ENGINEERS REQUIRED IN BRADFORD AND SHEFFIELD

JOHNSON & PHILLIPS Ltd. have a vacancy at their Bradford branch and another at their Sheffield branch for a SALES ENGINEER to handle the sales of capacitors, switchgear, transformers and cables. These are permanent and responsible appointments with scope for advancement, and for which cars are provided.

Applications are invited from men with H.N.C. in Electrical Engineering. Qualified men without sales experience will be considered for training.

Applications giving details of experience and training should be addressed to the Employment Manager, Johnson & Phillips Ltd., Charlton, London, S.E.7.

2138

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

ELECTRICAL ENGINEER

The National Institute for Research in Nuclear Science is constructing the Rutherford High Energy Laboratory, a centre for fundamental nuclear research, at Harwell.

An ELECTRICAL ENGINEER is required to work in a team responsible for the construction, installation and commissioning of experimental plant and equipment associated with a large research laboratory and for the subsequent maintenance and possible modification of such equipment.

Applicants should have served a recognised engineering apprenticeship or have had equivalent training; be corporate members of the Institution of Electrical Engineers or hold exempting qualifications.

Experience in installation, commissioning or maintenance of heavy electrical plant or large factory installations is desirable.

Salary scale: £1,005 (at age 25)—£1,535. The post is permanent and pensionable. Assistance is given with housing.

Please send a *Post Card* for further details to :—

The Personnel Officer, Rutherford High Energy Laboratory, Harwell, Nr. Didcot, Berks., quoting reference number VN77/48.

2121

MINISTRY OF AVIATION

requires ELECTRONIC ENGINEERS for development, design, production and inspection of guided missiles, computers, radar, line and radio communication equipment at Headquarters branches in Central London, at Bromley (Kent) and other locations in the Home Counties.

Quals.: Should have served a recognised engineering apprenticeship or have had equivalent training, and be Corporate Members of the Institution of Electrical Engineers, or have exempting quals. Experience of modern electronic practice in one or more of the fields desirable.

Salary £936-£1,430 (National) plus £55-£60 Inner London weighting for Central Headquarters posts or £40-£50 Outer London weighting for Bromley, Kent. Posts in Home Counties locations slightly less but will be brought into National pay scales on 1.1.62. Starting pay at age 34 or over £1,285 (National) with adjustments according to location. Excellent career prospects for promotion to senior posts and frequent opportunities for established pensionable appointment.

Forms from Ministry of Labour, Technical and Scientific Register (K), 28, King Street, London, S.W.1, quoting D.425/1A. Closing date 13th October, 1961.

2157

MINISTRY OF AVIATION, WALTHAM ABBEY

TECHNICIAN required for supervision and control of direct labour and of contractors engaged on the installation, testing and maintenance of H.T. and L.T. substations, main and domestic distribution and of electrical plant equipment for an explosives/chemical establishment.

Quals.: Recognised eng. apprenticeship. H.N.C. or equiv. Sound practical knowledge of electrical engineering. Experience in supervision of labour. Acquaintance with the special requirements of an explosives/chemical works advantageous. Salary £1,173 (on entry) to £1.438. Over 4 weeks' leave. Good prospects for promotion and pension. Technical college courses sponsored for suitable candidates.

Forms from Ministry of Labour, Technical and Scientific Register (K), 28, King Street, London, S.W.1, quoting D.444/1A. Closing date 18th September, 1961.

2158

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT ENGINEER (Relief) is required at Warwick Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade E.12, £670-£750 per annum.

The engineer will be expected to carry out shift relief duties and when not so employed will be available to undertake duties in the maintenance and operation departments. Shift allowance as laid down in the N.J.B. Agreement will be paid when shift duties are worked.

Applicants should have received a sound technical training and appropriate qualifications will be an advantage.

Apply, quoting Vacancy No. 228/61MD, on form AE6, available from Station Superintendent, Warwick Power Station, Emscote Rd., Warwick. to whom they should be returned when completed not later than 11th September, 1961.

2180

ELECTRICIANS

required for

Conduit and Pyrotenax installations.

Must be prepared to travel. Single men preferred, age 23 - 30 years.

Good remuneration and week-end leave.

Apply in writing for full details to :—

Employment Officer

GEORGE KENT LTD.

Biscot Road, Luton, Beds

2144

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following posts:—

Monmouthshire and Mid-Wales Area

GENERAL ASSISTANT ENGINEER
(Draughtsman),
MID-WALES AND NORTH MON.
DISTRICT (To be based at Brecon).

Salary N.J.B. Class E, Grade 10, Scale 4, £765/£870 per annum.

Applications stating age, present position, present salary, qualifications and experience should be addressed to W. E. Richardson, M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Llywelyn Road, Cwmbran, Mon. to arrive not later than 15th September, 1961.

Please quote reference 102/61/ER endorsing envelope "General Assistant Engineer (Draughtsman)."

Cardiff and East Central Area

GENERAL ASSISTANT ENGINEER,
PONTYPRIDD DISTRICT.

Salary N.J.B. Class F, Grade 11, Scale 4, £765/£870 per annum.

The duties of this post will be of a general natture and it is desirable that applicants should possess a Higher National Certificate in Electrical Engineering.

Applications stating age, present position, present salary, qualifications and experience should be addressed to C. L. Townsend, Assoc.I.E.E., Manager, Cardiff and East Central Area, Colchester Avenue, Cardiff, to arrive not later than 15th September, 1961.

Please quote reference 105/61/ER endorsing envelope "General Assistant Engineer."

R. G. WILLIAMS,
Secretary.

2174

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

THIRD ASSISTANT COMMERCIAL ENGINEER required at No. 1 Sub-Area Headquarters, Liverpool. Salary is within the range £1,275/£1,410 per annum (N.J.B. M/10).

Applicants should have experience in the commercial and domestic application of electricity and be capable of advising on and estimating for electrical installation work in all classes of commercial premises. They should also be capable of preparing lighting, heating and water heating schemes. Applicants should have suitable technical qualifications.

Appointment subject to medical examination. Pension scheme.

Special application forms are obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, and should be returned not later than 15th September, 1961.

2136

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Service Centre Supervisor, Wallasey

APPLICATIONS are invited for the above appointment in the North Wirral District from candidates experienced in the management of electrical appliance sales, staff direction and control and good customer relationships.

Salary within the range of £1,020/£1,140 per annum (Grade 5, N.J.C.). Excellent pension, holiday and sick pay schemes, subject to medical examination.

Forms of application obtainable from the Manager, No. 3 Sub-Area, Electricity House, 25, Newgate Street, Chester, should be returned not later than 15th September, 1961.

2137

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

SECOND ASSISTANT STATION CHEMIST, CASTLE DONINGTON POWER STATION
(Vacancy No. 199/61).

Applications are invited for the position of Second Assistant Station Chemist at Castle Donington Power Station, near Derby. Applicants should possess the Higher National Certificate in Chemistry and be experienced in the analysis and testing of fuels, water and oil, and in the interpretation of the results as applied to high-pressure power station plant.

Salary will be in accordance with Class L, Grade 11 (£1,115-£1,245 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 8th September, 1961.

STATION SHIFT CONTROL ENGINEER, LINCOLN POWER STATION
(Vacancy No. 200/61).

Applications are invited for the position of Station Shift Control Engineer at Lincoln Power Station, Spa Road, Lincoln. Applicants should have had a sound training and practical experience in a modern power station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be advantageous.

Salary will be in accordance with Class F, Grade 10 (£825-£940 per annum) plus shift enhancement.

Closing date for receipt of applications, 8th September, 1961.

ASSISTANT ENGINEER (Control Room), LEICESTER POWER STATION
(Vacancy No. 205/61).

Applications are invited for the position of Assistant Engineer (Control Room) at Leicester Power Station, Rawdykes Road, Leicester. Candidates for this post should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class G, Grade 13 (£715 - £805 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications, 15th September, 1961.

These appointments are pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.

2178

TURRIFF CONSTRUCTION CORPORATION LIMITED

Development Group

has opportunities for the following staff:—

SENIOR AND INTERMEDIATE ELECTRICAL DRAUGHTSMEN

with O.N.C. as a minimum qualification. Preference will be given to H.N.C. holders. Must have good expeerience in the electrical installation and lighting layouts for offices, factories, etc. Must also be capable of producing design and working drawings. Knowledge of building construction would be an advantage although not essential.

Top grade salaries paid. - Excellent opportunities for advancement. Pension and bonus scheme, ideal working conditions. Staff restaurant. Five-day week.

Applicants who must have good general technical education are invited to write to:—

Group Personnel Manager
TURRIFF BUILDING
Great West Road, Brentford, Middx.

2175

SITE ELECTRICAL SUPERVISOR

HEATRAE LIMITED are requiring a SITE ELECTRICAL SUPERVISOR in connection with the erection of electric heaters and control equipment for process heating on a number of industrial sites in Great Britain. The suitable applicant will be responsible for the erection and testing and must be capable of working with the minimum of supervision.

When not engaged on site he will be required to work at the company's works at Norwich and Great Yarmouth. The position is permanent and pensionable. Salary commensurate with age and experience.

Applications in writing giving details of experience and qualifications should be addressed to the Works Director, Heatrae Ltd., Norwich, NOR. 29.A.

2119

CROMPTON PARKINSON (CHELMSFORD) LTD.

require a

CHIEF OF ROTATING MACHINE TEST

THE company manufactures industrial A.C. motors/generators up to 4,000 h.p./kVA, industrial D.C. Motors/generators up to 1,500 h.p./kW, and traction D.C. motors/generators up to the largest sizes. The applicant is to be responsible for the testing of the whole of this equipment.

Apply in confidence giving particulars of age, experience and qualifications to Personnel Officer, Crompton Parkinson (Chelmsford) Ltd., Writtle Road, Chelmsford.

1952

JAMES BOOTH ALUMINIUM LIMITED

have immediate vacancies for:

JUNIOR ELECTRICAL ENGINEERS, having H.N.C. or Grad.I.E.E. as minimum qualifications, with experience either of heavy rolling mill drives or of factory distribution systems including 11 kV equipment and conversant with schematic diagrams and contractor equipment.

ELECTRICAL DRAUGHTSMEN, having O.N.C. as minimum qualification, with experience of installation and distribution drawings and capable of developing schemes from schematic diagrams.

Apply with full details, etc.:

The Engineering Director, James Booth Aluminium Limited, Argyle Street, Nechells, Birmingham, 7

2134

SOUTHERN ELECTRICITY BOARD

Installation Assistant
(Z.1334)

Swindon District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 11 (£825-£940 per annum). N.J.B. conditions of service.

Applicants should have had experience in the preparation of specifications and estimates for all types of electrical wiring installattions. They should be competent to supervise electricians and organise the allocation of work.

Demonstrator
(Z.1395)

Oxford District of No. 2 (Newbury) Sub-Area. Salary N.J.C. Grade 1 (£600-£700 per annum). N.J.C. conditions of service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualification would be an advantage.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications for both appointments on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks., and returned to him, quoting the appropriate "Z" number, not later than 11th September, 1961.

Foreman (Construction)

Sub-Area Engineer's Department of No. 1 (Southall) Sub-Area, located at Waterloo Road, Uxbridge. Salary N.J.I.C. Schedule E, Grade 2, £795 per annum, plus £35 London allowance. N.J.I.C. conditions of service.

Applicants must have had experience in the laying and jointing of cables up to and including 33 kV together with the necessary auxiliaries by direct labour and contract. Experience in the installation of indoor and outdoor substation plant would be an advantage.

Applications, in writing, giving details of age, experience, etc., should be forwarded to the Sub-Area Secretary, 2, Windmill Lane, Southall, Middlesex, quoting Z.1373, not later than 11th September, 1961.

2179

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

APPOINTMENT of THIRD ASSISTANT ENGINEER (System Design), Regional Electrical Department (Vacancy No. MR.198).

Applications are invited for the above appointment which in the first instance will be located in Nottingham, with eventual transfer to Birmingham.

Applicants should preferably hold a degree or have attained the Higher National Certificate standard or equivalent in electrical engineering. Preference will be given to candidates who have had experience of switchgear and protective gear systems.

Duties will include the preparation of transmission reinforcement schemes, calculation of fault levels, preparation of load flow diagrams and operation of D.C. and A.C. network analysers.

Salary will be in accordance with experience and qualifications within the range L.7, £1,260-£1,610 of the National Joint Board Agreement.

Applications in writing, quoting the above vacancy number, to the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, 53, Wake Green Road, Moseley, Birmingham, 13, to arrive not later than 11th September, 1961.

2155

Eastern Electricity

Area Board Headquarters

PRINCIPAL ASSISTANT,
OFFICE MECHANISATION

Applications are invited for the appointment of a Principal Assistant (Office Mechanisation), Chief Accountant's Department, Board Headquarters, to assist in the review of mechanised accounting systems throughout the Board's area and, in particular, to undertake systems analysis and programming for electronic data processing equipment.

Applicants' knowledge or experience should provide evidence of aptitude for this type of work; training will be provided for specialised equipment. An accountancy qualification or university degree would be an advantage.

The conditions of service will be in accordance with the National Joint Council Agreement and the salary will be Grade 7 (£1,250-£1,355).

Applications, stating age, education, qualifications, experience and present position, should be sent to reach the Chief Accountant, Eastern Electricity Board, Wherstead, Ipswich, Suffolk, by 29th September, 1961.

Fens Sub-Area

FITTER (Electrical),
PROTECTION SECTION
(186/61.R).

Applications are invited for the position of Fitter (Electrical) to work with the Sub-Area Protection Section, based at Thompsons Lane, Cambridge. Duties will include work in connection with the testing and commissioning of substations and protective gear over the whole Sub-Area.

N.J.I.C. rates and conditions. Present rate 5s. 6¾d. for 42-hour five-day week.

SALES REPRESENTATIVE,
PETERBOROUGH (187/61.R).

Candidates should have a good education, possess a progressive sales outlook and a comprehensive knowledge of electrical appliances and installation work. Possession of the E.D.A. Salesmanship Certificate would be an advantage.

Salary N.J.C. Grade 1 (£600-£700).

Apply by letter to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 15th September, 1961.

Northmet Sub-Area

THIRD ASSISTANT ENGINEER,
ST. ALBANS DISTRICT
(Ref. 1052) (188/61.R).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class H, Grade 9, £1,040 - £1,165.

Apply by letter to F. J. Drake, Assoc. I.E.E., Manager, Eastern Electricity Board, 107, St. Peter's Street, St. Albans, Herts., by 11th September, 1961.

Suffolk Sub-Area

SECOND ASSISTANT ENGINEER
(Operation and Maintenance),
SUB-AREA ENGINEER'S DEPT.
(189/61.R).

Candidates should be Corporate Members of the Institution of Electrical Engineers, or possess equivalent qualifications, and be experienced in the supervision of engineering staff engaged on :—

(a) Maintenance and constructional work on rural and urban distribution systems and major substations up to and including 33 kV.

(b) Centralised system control of operational switching and loading on H.V. distribution networks up to and including 33 kV.

The successful candidate will be expected to reside within close distance of the Sub-Area Control Centre, Ipswich Road, Badley, near Stowmarket, Suffolk.

Salary N.J.B. Class K, Grade 7, £1,350-£1,500.

Apply by letter to the Manager, Suffolk Sub-Area, Finborough Hall, Stowmarket, Suffolk, by 15th September, 1961.

2187

NORTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT
COMMERCIAL ENGINEER
(Installation and Servicing),
North-West District, Eccles.

Duties will include estimating for and supervising electrical installation work in all classes of property, supervision of servicing and domestic appliance repairs. Preference given to applicants with technical qualifications.

Salary scale £1,190/£1,325 p.a., Grade H.7. N.J.B. conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, 2, P.O. Box 493, and returned to him by 11th September, 1961.

THIRD ASSISTANT DISTRICT
ENGINEER,
CHORLEY DISTRICT.

Duties will include the operation, maintenance and construction of underground and overhead mains and substations and general distribution work, including standby duties.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary scale £1,040/£1,165 p.a., Grade H.9. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 4 Sub-Area, North Western Electricity Board, 40/41, Lune Street, Preston, and returned to him by the 11th September, 1961.

2163

TO ALL ELECTRICAL DESIGN ENGINEERS AND DRAUGHTSMEN

WE are shortly moving into a new modern office building and have vacancies for DESIGN ENGINEERS and DRAUGHTSMEN who are interested in installation design in all classes of industrial and commercial buildings, including

AIRPORTS	NEW HOSPITALS
HOTELS	OFFICE BLOCKS
UNIVERSITIES	SCHOOLS

both at home and abroad.

Spring and summer holidays, pension scheme and luncheon vouchers.

Apply in writing stating age, experience, qualifications, present salary and salary required to :—

J. ROGER PRESTON & PARTNERS
15, North Audley Street
London, W.1

2149

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

APPLICATIONS are invited from suitably qualified engineers for the following appointments in the Technical Branch of the Regional Electrical Department.

1. One THIRD ASSISTANT ENGINEER (Protection), Grade 8, Class K (£1,145-£1,410 per annum), based on Leeds (Test Laboratory), to undertake testing of complete protective equipments and components and investigate problems arising on equipment in service.

2. Three FOURTH ASSISTANT ENGINEERS (Protection), Grade 11, Class K (£900-£1,165 per annum), based on Leeds (Test Laboratory), to assist with the work described under Vacancy (1).

3. One THIRD ASSISTANT ENGINEER (Protection), Grade 8, Class K (£1,145-£1,410 per annum), based on Leeds (Design Section), to undertake the checking of schematic diagrams, wiring diagrams and specifications for protective and control gear and associated apparatus. Site commissioning experience would be an advantage.

4. Three FOURTH ASSISTANT ENGINEERS (Protection), Grade 10 or 11, Class K (£980 - £1,245 or £900 - £1,165 per annum), based on Leeds (Design Section), to assist with the work described under Vacancy (3).

5. Five FOURTH ASSISTANT ENGINEERS (Protection), Grade 11, Class K (£900-£1,165 per annum), based on North Tees (2), Leeds, Wakefield and Keadby, to assist with testing and commissioning of generators, transformers, switchgear, lines and cables and with the testing, commissioning and maintenance of protective gear and control and indicating equipment for switchgear and transformers.

In all cases experience in a switchgear manufacturer's works would be an advantage.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 22nd September, 1961.

2183

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

Electrical Engineer's Department,
Northfleet District

ENGINEER (Vacancy No. 147D/61) required to join a District team commissioning major electrical plant in generating and transforming substations in West Kent and maintaining automatic protective and control gear on such plant in that area. Previous experience in similar work is essential.

Candidates must possess Higher National Certificate in Electrical Engineering or equivalent qualifications. Ability to make calculations of unbalanced fault conditions and to write a good report is desirable. The successful candidate will be required to live within approximately 10 miles of the District Headquarters.

The post is designated Third Assistant Engineer (Technical).

Salary range £1,180 to £1,460 per annum, including London allowance. The conditions of service are as decided by the National Joint Board, with generous holidays and sick pay scheme and a contributory superannuation scheme.

Applications giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity House, Lower Ham Road, Kingston-upon-Thames, Surrey, to arrive by 13th September.

2169

Situations Vacant (continued)

SOUTH WALES ELECTRICITY BOARD

Principal Assistant, Secretary's Department

APPLICATIONS are invited for the position of a PRINCIPAL ASSISTANT in the Secretary's Department at the Head Office of the Board, St. Mellons, Cardiff.

The duties of the position will be mainly administrative in character, but will require some ability for work of a public relations character. Candidates, who must have general administrative experience, should be able to demonstrate capacity :—

(i) to write material for inclusion in handbooks, etc.;
(ii) to prepare announcements for issue to the Press;
(iii) to organise conferences, visits, etc.;
(iv) to act as secretary to various committees.

The varied range of duties calls for qualities of energy and adaptability. Possession of a suitable secretarial qualification or a university degree will be an advantage, and a knowledge of the supply industry is desirable.

The duties may be varied according to the qualification of the successful applicant. The salary will be within N.J.C. Grade 7 (£1,250/£1,355) or Grade 8 (£1,380/£1,500 per annum) as appropriate.

Applications stating age, present position, present salary, qualifications and experience should be addressed to the undersigned to arrive not later than 22nd September, 1961.

Envelopes should be endorsed "Principal Assistant, Secretary's Department, 106/61/ER."

R. G. WILLIAMS,
Secretary.

2176

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT SHIFT CHARGE ENGINEER is required at Stourport "A" and "B" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade K.8, £1,275-£1,410 per annum, plus 10% for shift duties.

Applicants should have received a sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear, and a knowledge of P.F. firing is desirable. Appropriate technical qualifications would be an advantage.

Apply, quoting Vacancy No. 225/61MD, on form A.E.6, available from the Station Superintendent, Stourport Power Station, Severn Side, Stourport-on-Severn, Worcs., by 8th September, 1961.

W. F. CUSWORTH,
Assistant Regional Director.

2160

BRITISH JEFFREY-DIAMOND LTD.

require the services of an experienced

A.C. MOTOR DESIGNER

able to undertake the electrical and mechanical design of the range of mining motors manufactured by the company.

This involves standard S.C. motors and special-purpose motors where original development is necessary. The successful applicant will join a well-established but quickly expanding company.

Replies to be addressed to the Secretary, British Jeffrey-Diamond Ltd., Stennard Works, Wakefield.

2040

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER, WOKING DISTRICT.

Salary £1,115 to £1,245 per annum under N.J.B. Class G, Grade 7.

ASSISTANT DISTRICT ENGINEER, WOKING DISTRICT.

Salary £965 to £1,090 per annum under N.J.B. Class G, Grade 9.

Posts are superannuable. Both appointments occur in a rapidly expanding urban and rural district. Applicants of good general education should have had technical training to Higher National Certificate standard, with practical experience of general distribution work and be capable of assisting on planning, construction and maintenance work.

Consideration will be given to a private car allowance and in appropriate circumstances to assistance with housing.

Applications, quoting ref. ER and stating which post applied for, on forms from the District Manager, SEEBOARD, 4, Chobham Road, Woking, to be returned by 13th September, 1961.

GEORGE WRAY,
Secretary.

2194

ST. HELENS EDUCATION COMMITTEE

St. Helens Technical College

Principal:
T. E. A. K. Jackson, M.A.(Oxon), Ph.D.

HEAD OF DEPARTMENT OF ELECTRICAL ENGINEERING

APPLICATIONS are invited for this post, vacant owing to the retirement of the present Head. The post is Grade II (£1,600 to £1,800) and the Head is assisted by a full-time teaching staff of eight, including one Senior Lecturer and three Lecturers. A full range of courses in Electrical Engineering is provided, including Professional, H.N.C. and Craft courses.

Candidates should have high academic qualifications, extensive industrial experience and a capacity to organise and develop the work of a growing department.

Further particulars and forms of application may be obtained from the undersigned. Last date for the receipt of applications 20th September, 1961.

N. F. NEWBURY,
Director of Education.

Education Office,
St. Helens.
August, 1961.

2117

THE ENGLISH ELECTRIC CO. LTD.

FRACTIONAL HORSE POWER MOTOR DIVISION

English Electric invite applications for appointments to the outside sales staff specialising in sale of fractional horse power motors in a number of Branch territories including the London Area.

Qualified engineers already experienced in this field and engineers who feel that they have qualifications which would enable them to succeed in this field are invited to submit details of their experience and training, together with relevant personal data to Mr. G. N. Smith, Dept. G.P.S., English Electric House, Strand, London, W.C.2, quoting reference number ER0097A.

2118

EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointment:—

Applicants should state age, qualifications, experience, etc., and quote the vacancy number.

Lincolnshire Sub-Area

FOURTH ASSISTANT DISTRICT COMMERCIAL ENGINEER, BOSTON DISTRICT
(Vacancy No. 107/61).

Salary N.J.B. Class F, Grade 11, £765 to £870 per annum.

The duties include assisting in the negotiations of the supply of electricity to consumers; advise on tariffs; electrical installations and appliances; street lighting; sales activities and consumer service.

Applicants should have had experience in the work of a District Consumers' Office.

Ability to drive a motor vehicle is essential, and the person appointed will be required to reside in or near Boston.

Applications should be forwarded to the Manager, Lincolnshire Sub-Area, North House, Grantham, Lincs., by the 15th September, 1961.

2193

ELECTRICAL ENGINEER

required by SIERRA LEONE GOVERNMENT Electricity Department on contract for 1 tour of 15-18 months. Salary according to age and experience in scale (including inducement pay) rising to £2,025 a year. Gratuity at rate of 15% of total salary drawn. Outfit allowance £60. Free passages. Liberal leave on full salary.

Candidates under 50 years must be Graduate or Corporate Members of the Institution of Electrical Engineers and must have had experience in the design and erection of overhead power lines, commissioning of electrical plant of 2,000 kW.

Apply to Crown Agents, 4, Millbank, London, S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience, and quoting reference M2A/51393/EF.

2141

SUPERVISOR

required for repair shop operating East End London. Experience in A.C. and D.C. repairs and rewinds essential. State age and experience.—Box 2122.

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

Richborough Power Station

APPLICATIONS are invited for the following appointments at Richborough Power Station, now being constructed on the Kent Coast between Ramsgate and Sandwich. The ultimate capacity of the station is three 120-MW reheat units.

Applicants should have had managerial and operational or maintenance experience in a large modern station; commissioning experience would be an advantage.

DEPUTY STATION SUPERINTENDENT
(Vacancy No. 226/61).
Salary N.J.B. K.2, £1,920-£2,085.

OPERATION SUPERINTENDENT
(Vacancy No. 231/61).
Salary N.J.B. K.4, £1,650-£1,830.

MAINTENANCE ENGINEER (Mechanical)
(Vacancy No. 233/61).
Salary N.J.B. K.5, £1,535-£1,720).

MAINTENANCE ENGINEER (Electrical)
(Vacancy No. 234/61).
Salary N.J.B. K.5, £1,535-£1,720.

MAINTENANCE ENGINEER (Instruments)
(Vacancy No. 235/61).
Salary N.J.B. K.7, £1,350-£1,500).

Applications stating age, details of experience and qualifications, and quoting vacancy number, should be sent to the Personnel Officer, Central Electricity House, Lower Ham Road, Kingston-upon-Thames, Surrey, to arrive by 18th September.

2186

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

Assistant Electrical Engineer

APPLICATIONS are invited for the appointment of ASSISTANT ELECTRICAL ENGINEER in the Regional Research and Development Department.

Applicants, preferably under 26, should possess an honours degree or equivalent. The work is varied and embraces all aspects of generation and transmission of electrical energy. Current work is concerned with novel methods of de-icing conductors, preventing insulator pollution and economic system loading. Candidates will be expected to have a sound theoretical knowledge. Previous research experience would be an advantage.

Good promotion prospects exist within the Board's Research and Development Department. Salary on a scale within the range £765-£1,090 or £965-£1,410 per annum, depending on qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 30th September, 1961.

2185

PROJECT ENGINEER (SALES)

to liaison between prospective, and established, customers in the metal rolling industries throughout the U.K. in order to promote complete, and special, electrical control equipments.

A minimum qualification of H.N.C. mech. or elect. is desirable, and applicants should have experience in steelworks practice or the metal rolling industries.

Salary according to experience. A car will be provided.

Applications will be treated in confidence and should give details of education, experience and present salary.—Box 2188.

A further opening occurs for a

TRANSFORMER DESIGN ENGINEER

to design transformers for the Electronic and Allied Industries.

An Engineer studying for O.N.C. would be considered for the appointment. The position offers excellent prospects in a well established expanding company.

Please write to the : **General Manager,**
READING WINDINGS LTD., 169, Basingstoke Road, Reading, Berks

2150

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

FOURTH ASSISTANT ENGINEER (Planning) required at No. 1 Sub-Area Headquarters, Liverpool. Salary will be within range £1,040/£1,165 per annum (N.J.B. Class M, Grade 13).

Applicants should have had sound training in all aspects of the distribution of electricity, and have a knowledge of the technical and economic principles underlying the design of distribution systems; the possession of suitable technical qualifications is desirable.

Appointment subject to medical examination. Pension scheme.

Special application forms, obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, should be returned not later than 15th September, 1961.

2181

CITY OF MANCHESTER

Housing Committee

APPLICATIONS invited for the appointment of SENIOR ASSISTANT (Electrical Services), A.P.T. Grade V, £1,310-£1,480 per annum (at present under review).

Candidates must be experienced in preparation of schemes and estimates for gas and electrical installations in houses and multi-storey flats, including specifications, supervision of work in progress, interim valuations and final accounts, and be capable of undertaking necessary design work for under-floor electric heating and warm air gas heating installations.

Preference will be given to those holding H.N.C. in Electrical Engineering, or those eligible for election to or who are members of the Institution of Electrical Engineers.

Applications giving full details to be received by the Director of Housing, Town Hall, Manchester, 2, by 15th September, 1961.

2152

LEADING ELECTRICAL CONTRACTORS

have the following vacancies :—

TWO SENIOR CONTRACTS ENGINEERS capable of dealing with major installations from estimate to final account stage.

EXPERIENCED ENGINEERS for planning/estimating and supervision.

YOUNG MEN with clerical ability, preferably some site experience, for progress, checking and taking off quantities.

Vacancies in Midland and Merseyside areas.

LEE BEESLEY
119, Holloway Head, Birmingham, 1
Tel. Midland 9541

1944

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

THIRD ASSISTANT ENGINEER
(Distribution Design).

Applicants should have had experience in the design, construction and operation of H.V. and L.V. systems associated with a large industrial urban and rural network.

Salary N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 15th September, 1961.

No. 6 (Hull) Sub-Area

GENERAL ASSISTANT ENGINEER
(Surveyor).

Applicants should have had sound practical experience in the survey of routes for H.V. and L.V. overhead lines and have experience in the preparation of profile drawings and pole schedules in accordance with B.S.1320 or other overhead line specifications.

Salary N.J.B. Class L, Grade 16 (Scale 4), £765/£870 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston-upon-Hull, not later than 15th September, 1961.

2177

SCULL ELECTRICAL LIMITED

SUPERVISING/CONTRACTS ENGINEER

required

having been apprenticed in electrical contracting. Experience and ability in the running of contracts, including labour control, progressing materials and resolving of problems essential.

First-class salary, superannuation scheme, transport facilities and excellent opportunities in a growing organisation available for someone with experience, drive and initiative.

Applications, which will be treated in strict confidence, to :—

Managing Director
SCULL ELECTRICAL LIMITED
Redcliffe House, Bristol 3

2162

ELECTRICAL MACHINE DESIGNER

required for manufacturers in S.W. Lancs. H.N. Certificate minimum. Should be familiar with detail design of all types of A.C. and D.C. machines and electro-magnetic equipment.

Progressive post with contributory superannuation scheme after qualifying period.

State age, qualifications, previous experience and salary required. All applications in strict confidence. — Box S.959, Lee & Nightingale, Liverpool, 2.

158

Situations Vacant (continued)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Edinburgh and Borders Area

THIRD ASSISTANT ENGINEER (Planning and Development), Area Headquarters, Dewar Place, Edinburgh.

Salary N.J.B. Schedule A, Class L, Grade 10, Salary Scale No. 10, £1,190/£1,325 p.a.

Applications, on the standard form obtainable from the undersigned or any other Area Manager, should be submitted not later than 15th September, 1961.

Applicants for this superannuable appointment should have sound engineering training and experience in the design and layout of densely loaded distribution networks in city areas and rural systems at pressures up to and including 33 kV; the application of modern protective equipment, and of the calculation and preparation of load flow diagrams and fault levels. Applicants must also possess as a minimum qualification a Higher National Certificate in Electrical Engineering or its equivalent.

Conditions of service will be in accordance with the National Joint Board Agreement for the electricity supply industry. The successful candidate will require to reside within a reasonable distance of Area Headquarters.

C. H. A. COLLYNS,
Manager.

52, Melville Street,
Edinburgh, 3.

2139

TECHNICAL SALES REPRESENTATIVES

MAWDSLEY'S LIMITED
Dursley, Glos.

MAKERS of special purpose rotating electrical machinery with wide and varied applications require technically qualified (Degree or H.N.C.) sales representatives in the West Midlands centred on Birmingham and in the London area.

Experience in design or manufacture of the Company's type of product, and related sales experience are essential qualifications.

Salaries will be negotiated. A pensions and life assurance scheme is in operation.

Applications will be treated in ABSOLUTE CONFIDENCE and should be addressed to the Personnel Adviser, giving a full summary of career and training.

2173

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

SHIFT CHARGE ENGINEER is required at Stourport "A" and "B" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.6, £1,440-£1,610 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear, preferably in a large modern power station, are required, and the possession of appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 224/61MD, on form A.E.6, available from the Station Superintendent, Stourport Power Station, Severn Side, Stourport-on-Severn, Worcs., by 8th September, 1961.

W. F. CUSWORTH,
Assistant Regional Director.

2161

ELECTRICAL ENGINEERS AND DRAUGHTSMEN

Applications are invited from qualified ELECTRICAL ENGINEERS and DRAUGHTSMEN, to work on nuclear and special engineering development projects in the fields of power application and automatic control. The positions are pensionable and offer a progressive career with the company.

Please write, giving full details of qualifications, age, and experience to:

Chief Engineer
JOHN BROWN (S.E.N.D.) LIMITED
20, Eastbourne Terrace, London, W.2

2115

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

Electrical Engineer's Department, Croydon District

FOURTH ASSISTANT ENGINEER (Vacancy No. 203A/61) required for transmission, operation and maintenance work in the District. Preference will be given to applicants with some experience of transmission and theoretical qualifications leading ultimately to Associate Membership of the I.E.E.

Salary N.J.B. Grade 11, £940 to £1,215 per annum, including London allowance, with prospects of promotion subject to satisfactory service.

Applications giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity House, Lower Ham Road, Kingston-upon-Thames, Surrey, to arrive by 13th September.

2167

ELECTRICAL ENGINEER

North Borneo Electricity Board

APPLICATIONS are invited for the above post on contract for 1 tour of 3 years. Salary according to qualifications and experience in scale (including inducement allowance) rising to £2,534 a year. Gratuity at rate of 15% of basic salary drawn for each completed year of service. Outfit allowance of £60. Quarters at moderate rental. Free passages. Liberal leave on full salary.

Candidates, under 45 years of age and preferably Corporate Members of the I.E.E., must be able to supervise staff engaged in installation and maintenance of diesel generating plant, and capable of designing overhead and underground distribution schemes up to 33 kV. They should also be able to organise general office staff and departments dealing with tariffs and stores.

Apply to Crown Agents, 4, Millbank, London, S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience, and quoting reference M2A/51387/EF.

2148

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable position as a THIRD ASSISTANT ENGINEER (Protective Gear) in the Technical Section of the Chief Engineer's Department at Board Head Office.

Applicants should possess a Degree or Higher National Certificate in Electrical Engineering and should have had experience in the design and application of protective gear and in fault calculations, both symmetrical and unsymmetrical. Preference will be given to candidates having previous experience at the works of an electrical manufacturer.

Salary N.J.B. Class K, Grade 7 (£1,235-£1,500) or Grade 8 (£1,145-£1,410).

Applications, quoting reference E26/61, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 15th September, 1961.

2172

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

Brighton "A" Power Station

GENERAL ASSISTANT ENGINEER (Relief) (Vacancy No. 230/61). The successful applicant will be given control room training, will be required to assist charge engineers in operational duties, and to act as an observer in testing of plant. General engineering experience and/or an engineering apprenticeship preferred.

Salary N.J.B. Class H, Grade 14, £715-£805 per annum plus £90 per annum shift allowance when applicable.

Applications giving age, details of qualifications, experience, etc., should be sent to the Station Superintendent, Brighton "B" Power Station, Portslade-by-Sea, Sussex, to arrive by 13th September, 1961.

2168

WAR DEPARTMENT

requires an ELECTRICAL ENGINEERING OFFICER for R.E.M.E. Workshops at Christchurch, Hants., to supervise and control preparation of technical handbooks on line and cypher equipments; conduct trials of new cypher equipments and produce trials reports; to advise design establishments on matters affecting maintenance and repair of equipments and to analyse defects and modifications for telecommunications equipment.

Quals. and Exp.: Engineering apprenticeship and Corporate Membership of the Institution of Electrical Engineers and experience on the above type of work. Knowledge of service equipments and repair and maintenance procedure would be an advantage. Salary £1,416 to £1,900. Excellent career prospects.

Forms from Ministry of Labour, Technical and Scientific Register (K), 28, King Street, London, S.W.1, quoting D.429/1A. Closing date 18th September, 1961.

2156

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

POWER STATION SUPERINTENDENT is required for Stourport "A" and "B" Power Stations. Salary in accordance with N.J.M. Scale C.6, £2,380-£2,595 per annum.

Candidates should have wide experience in the operation and maintenance problems of a large modern generating station, and should possess sound administrative ability. They should preferably hold a University Degree in Engineering or be Corporate Members of the Institution of Electrical and/or Mechanical Engineers.

Apply, quoting Vacancy No. 226/61MD, on form A.E.6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 8th September, 1961.

W. F. CUSWORTH,
Assistant Regional Director.

2159

CLASSIFIED ADVERTISEMENTS ARE PREPAID

SOUTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT
ENGINEER (Commercial),
BRISTOL CENTRAL (Commercial)
DISTRICT.

Salary according to Class K, Grade 9, Salary Scale 10 (£1,190 to £1,325 per annum) of the N.J.B. Agreement.

The successful candidate will be responsible for duties in connection with the general commercial activities of the District, with special responsibilities in relation to negotiations with industrial consumers, sales and contracting.

Applicants should have a sound theoretical and practical knowledge of electrical installations and be conversant with I.E.E. and factory regulations. They should be capable of estimating for electrical installations in factories, domestic premises, housing estates, etc., and be competent to advise consumers on all classes of installation work, choice and performance of apparatus, and also on tariff matters.

Candidates should possess appropriate technical qualifications at least equivalent to the Higher National Certificate, and the possession of a current driving licence is desirable.

Applications for this post to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Commercial Manager, Bristol Central, South Western Electricity Board, Electricity House, Colston Avenue, Bristol, 1. Closing date for receipt of completed applications is 16th September, 1961. 2182

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region, North Thames Division

APPLICATIONS are invited for the following appointment in the System Operation Department, Thames North Grid Control Centre, Redbourn, near St. Albans, Herts.

THIRD ASSISTANT ENGINEER
(S.V. No. 1516).
Salary N.J.B. Class K, Grade 8, Scale 11, £1,105-£1,410 per annum plus 10% shift allowance.

Applicants who applied as a result of the recent advertisement need not re-apply as they will automatically be reconsidered.

The commencing salary will be within the above range at a point commensurate with qualifications and experience. The minimum technical qualification required is the Higher National Certificate in Electrical Engineering.

Some generating station and/or transmission/technical experience is essential. The successful applicant will be required to undertake shift duties in the Grid control room.

Forms of application (AE.6/ACT) may be obtained from the Board's Headquarters, or from any Divisional Offices of the Board, and should be addressed to the Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 9th September, 1961, quoting reference S.V. No. 1516. 2140

TRANSFORMERS (WATFORD) LTD.

require, due to expansion,

Senior and Junior Draughtsmen

experienced on power and distribution transformers. Good salary plus production bonus. Non-contributory pensions scheme. Excellent working conditions.

Apply, with full particulars, Chief Draughtsman, Transformers (Watford) Ltd., Sandown Road, Watford, Herts. 2043

ASSISTANT engineer required to train in preparation of estimates for overhead line construction. Permanency right man.—Box 1954.

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

Third Assistant Engineer (Communications)

APPLICANTS should have obtained a Higher National Certificate or equivalent qualification and have had some training/experience in communications systems.

Duties will include assisting in the supervisory contol, radio telephony and communications systems in the area.

Salary N.J.B. Class J, Grade 11, £965-£1,090 per annum.

Applications should be made on application forms obtainable from the Area Manager, North of Scotland Hydro-Electric Board, 7, Dudhope Crescent Road, Dundee. 2133

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 253/ER/61

APPLICATIONS are invited for the superannuable N.J.B. appointment of STATION SHIFT CONTROL ENGINEER, Upper Boat Power Station, near Pontypridd, Glam.

Salary Class H, Grade 10, Scale 7, £965-£1,090 per annum, plus 10% shift allowance.

Applicants should possess H.N.C. or equivalent qualifications and have had operating experience in a power station.

Special application forms obtainable from Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 16th September, 1961. 2184

APPLICATIONS are invited by Kennedy & Donkin, 12, Caxton Street, London, S.W.1 (Ref. RFL), for an assistant in the cable department at their Weybridge office. Applicants must be qualified electrical engineers with experience in design, manufacture and installation of cables for transmission and generation projects. 2142

APPLICATIONS are invited for the appointment of a junior electrical engineering assistant. Applicants, preferably having served an apprenticeship at a manufacturer's works, should be Graduate Members of the I.E.E. and have had considerable experience in the installation and operation of light and heavy electrical equipment. Knowledge of radio an advantage. Applications giving full details of age, experience, etc., and salary required should be addressed to—Engineer-in-Chief, The South Staffordshire Waterworks Company, 50, Sheepcote Street, Birmingham, 15. 2164

APPLICATIONS are invited from electrical engineers for the supervision of major cable installation work in various parts of the country. Applicants must have wide experience in all types of H.T. distribution work, particularly the laying of cables underground, and be able to inspect and assess fully cable routes and subsoil conditions likely to be encountered. Please reply stating age, experience and qualifications, together with three references and salary required, to—Edward A. Pitcher & Ptnrs., 58-60, Cannon Street, London, E.C.4. 2047

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., Longridge House, Manchester, 4. Electrical surveyors required for Manchester and Sheffield districts. Permanent positions carrying progressive salary scale £825 to £1,225 with non-contributory pension. Candidates. aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. 2165

CONTRACTORS, senior and assistant engineers required by well-established firm, central London, for quality work of all types. Positions offer scope for advancement for capable and energetic engineers. Write fullest detail, in confidence, of experience, training, age and salary required.—Box 133.

CONTRACTORS N.W. Lond. require experienced cost accounts clerk for interim valuations and preparation of final accounts. This is a senior appointment offering good salary, pension and housing facilities. Only those with similar experience should apply. Write full details—J. W. Russell Limited, 18, Queens Road, Watford. 2193

CROMPTON PARKINSON Limited require a sales engineer for their Overseas Division, London. The work will include liaison between home and overseas factories and the company's world-wide marketing organisation, as well as assistance in the export sales promotion of the company's rotating plant products. A really go-ahead young man should find excellent opportunity through this appointment. Applications, including details of education, experience and salary required, should be sent to—Ref. XS, Crompton Parkinson Ltd., Crompton House, Aldwych, London, W.C.2. 2189

EAST Africa. Assistant engineer required; must be experienced in estimating and supervision for electrical contracts of all types and values. Write giving full details to—Box 2143.

ELECTRICAL contract engineers (2) required with at least H.N.C. or equivalent for medium/heavy industrial rotating plant and associated control gear. Also one assistant. Interesting work with good prospects. Applications stating age, qualifications and experience to—Contracts Manager, Harland Engineering Co. Ltd., Drives Division, 47/48, Berners St., London, W.1. 2166

ELECTRICAL engineer (assistant) for design estimating and supervision of contracts. This is a senior appointment offering good salary, also flat available. Company established over half a century.—The Kingsdown Electrical Co. Ltd., 436, Brighton Road, South Croydon. 2035

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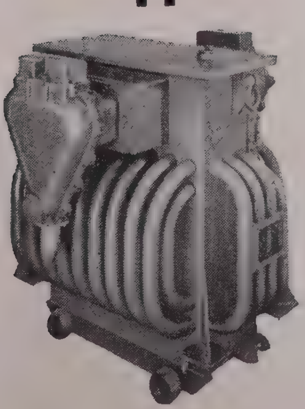

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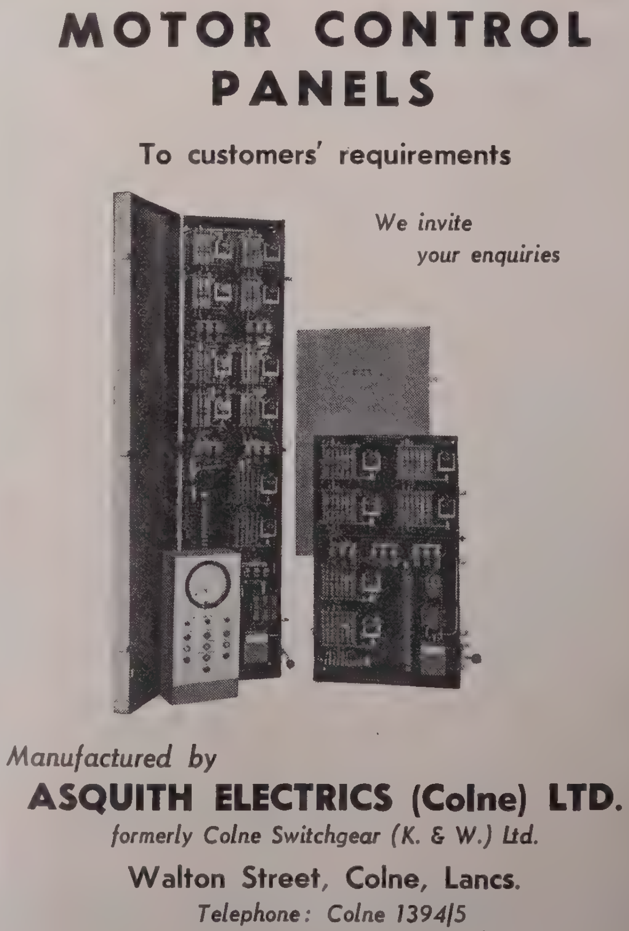

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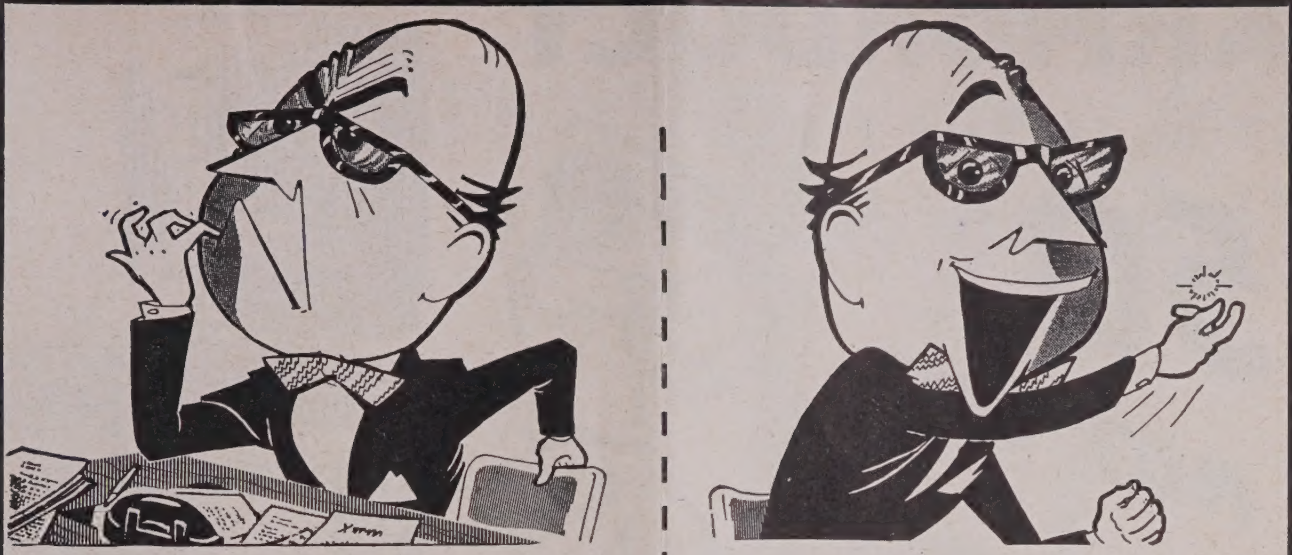

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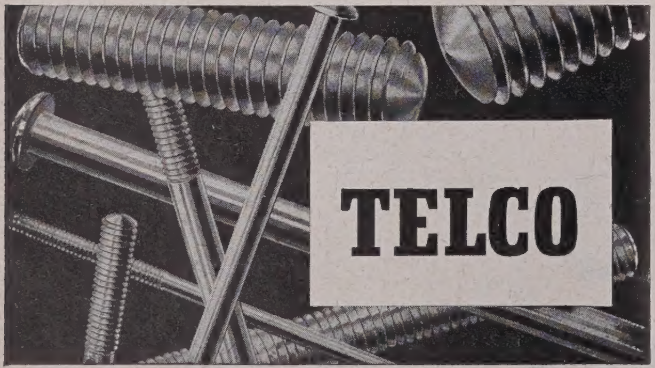

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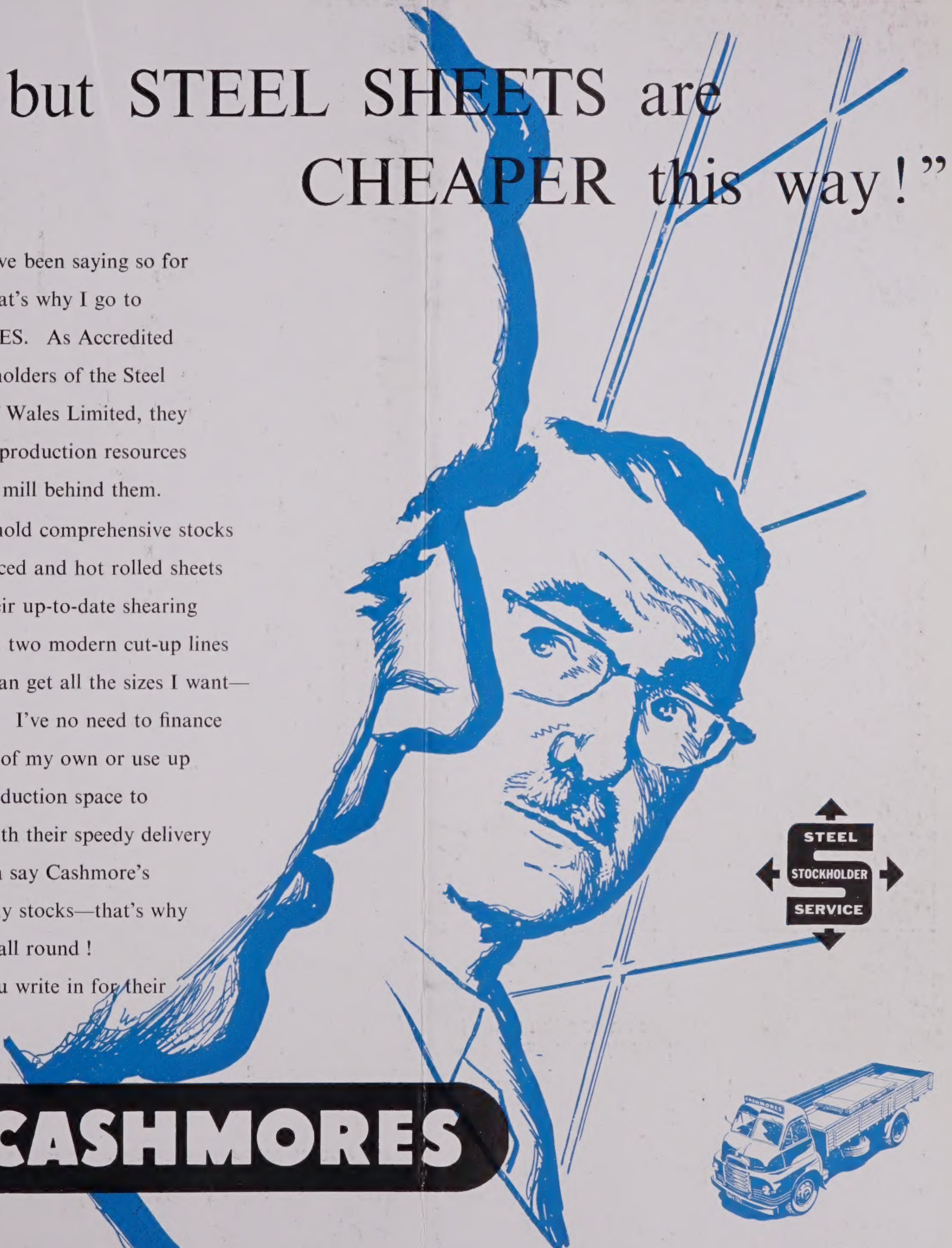

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